Page Printer Formatting Aid

User's Guide

S544-5284-11

Note:
Before using this information and the product it supports, read the information in “Notices” on page 635.

This edition applies to IBM Page Printer Formatting Aid Version 1 Release 1 Modification 0 (Program Number 5688-190). This edition applies to all subsequent releases and modifications until otherwise indicated in new editions.

This edition replaces S544-5284-10.

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About this publication

This publication describes how to use the Page Printer Formatting Aid (PPFA) to create and compile page definitions and form definitions for printing or viewing files with Advanced Function Presentation™ products, such as:

- InfoPrint® ProcessDirector
- InfoPrint Manager
- Print Services Facility™

Who Should Use This Publication?

This publication is for anyone who wants to use PPFA to create form definitions and page definitions (traditional and record format). This publication has been written assuming that you are one of the following:

- A first-time user

  You are using PPFA for the first time to create form definitions and page definitions. You are familiar with system commands, but you are not familiar with Print Services Facility (PSF) concepts and Page Printer Formatting Aid parameters. You should read all of the information contained in this publication, and then use it as a reference.

  For more information about AIX® concepts, refer to *InfoPrint Manager for AIX: Introduction and Planning Guide*, G550-1060, and *InfoPrint ProcessDirector for AIX: Planning and Installation*, G550-1045.

  For more information about Windows® concepts, refer to *InfoPrint Manager for Windows: Introduction and Planning Guide*, G550-1071, and *InfoPrint ProcessDirector for Windows: Planning and Installation*, G550-1365.

  For more information about VSE, MVS™, or VM, refer to the Application Programming Guide for the platform you are using.
- An intermediate user

  You are familiar with print server concepts and with Page Printer Formatting Aid parameters and you know the difference between a logical page and a physical page. You already know how to create and use form definitions and page definitions. Use this publication as a reference to learn more about PPFA commands and syntax. Refer to the examples for useful information.
- An advanced user

  You understand print server concepts and have used PPFA to create form definitions and page definitions. You understand the use of data stream processing. You will use this publication mostly as a reference. Chapter 5, "Creating Complex Printouts" might be especially helpful.

Note: Not all of the functions provided by PPFA are supported in all print server licensed programs. Refer to the information for the print server licensed program that you are using to determine which functions are supported. For more information about a specific environment, see Appendix A, "System Dependencies for PPFA" for the steps required to process page definitions and form definitions.

Abbreviations

AFP™	Advanced Function Presentation

BCOCA	Bar Code Object Content Architecture™
CMR	Color management resource
IOCA	Image Object Content Architecture
IPDS™	Intelligent Printer Data Stream™
LCDS	Line Conditioned Data Stream
MO:DCA™	Mixed Object Document Content Architecture™
MO:DCA-P	Mixed Object Document Content Architecture-Presentation
PCS	Profile Connection Space
PMF	Print Management Facility
PFFA	Page Printer Formatting Aid
PSF	Print Services Facility

Related Publications

These additional publications are available:

Publication	Order Number
IBM Overlay Generation Language/370: User's Guide	S544-3702
Advanced Function Presentation: Programming Guide and Line Data Reference	S544-3884
Mixed Object Document Content Architecture Reference	SC31-6802
Font Object Content Architecture Reference	S544-3285
Graphic Object Content Architecture Reference	S544-5498
Image Object Content Architecture Reference	S550-1142
Presentation Text Object Content Architecture Reference	SC31-6803
Color Management Object Content Architecture (CMOCA) Reference	S550-0511
Bar Code Object Content Architecture (BCOCA) Reference	S544-3766
Print Services Facility/VSE: Application Programming Guide	S544-3666
Print Services Facility/VSE: System Programming Guide	S544-3665
Print Services Facility/VM: Application Programming Guide	S544-3677
Print Services Facility/VM: System Programming Guide	S544-3680
PSF for AIX: Upload Configuration Guide for SNA	S544-5422
PSF for AIX: Upload Configuration Guide for TCP/IP	S544-5423
PSF for z/OS: AFP Download Plus	S550-0433
PSF for z/OS: Customization	S550-0427
PSF for z/OS: Diagnosis	G550-0428
PSF for z/OS: Download for z/OS	S550-0429
PSF for z/OS: Introduction	G550-0430
PSF for z/OS: Messages and Codes	G550-0432
PSF for z/OS: Security Guide	S550-0434
PSF for z/OS: User's Guide	S550-0435
PSF for z/OS: Library Collection CD-ROM,	SK5T-8814
AFP Conversion and Indexing Facility: User's Guide	S550-0436
IBM Infoprint Fonts: Font Summary	G544-5846
InfoPrint Manager: Reference	S550-1052
z/OS InfoPrint Server User's Guide	S544-5746

Reading Syntax Diagrams

The syntax for PPFA commands is shown using graphic notation. To read the diagrams, move from left to right and top to bottom, following the main path line.

Style Rules:

Syntax diagrams use the following style rules to show how to enter commands and parameters:

- A word in uppercase ***must*** be spelled exactly as shown, but may be coded in any case. For example in coding, FORMDEF or FormDef or formdef are equivalant.
- A word in all italic, lowercase letters shows a parameter that you can replace. For example:

  name

  shows that you replace *name* with a resource name that is retained in the library.
- A parameter above the line shows the default parameter. For example, SBCS is the default parameter in the syntax diagram for the **FONT** command:

```
                    ┌─SBCS─┐
►►──FONT── .. ──────┤      ├──;─────────────────────────────────►◄
                    └─DBCS─┘
```

Symbols:

Syntax diagrams use symbols to help you follow the flow of information they communicate:

- Statements begin with:

  ►►─
- and end with:

  ─►◄
- Statements longer than one line continue to a second line with:

  ─►
- Where they resume with:

  ►─

Required Parameters:

A parameter that you must include is displayed on the main path line. For example, the syntax diagram for the **SEGMENT** command:

```
►►──SEGMENT──name──;───────────────────────────────────────────►◄
```

shows that you must follow **SEGMENT** with its required parameter.

If there are two or more required parameters from which to choose, the parameters are shown with the first choice on the main path line and the other choices on branch lines under it. For example, the partial syntax diagram for the **DIRECTION** Command:

```
►►──DIRECTION───┬─ACROSS─┬──────────────────────────────────────►◄
                ├─DOWN───┤
                ├─BACK───┤
                └─UP─────┘
```

shows that you must type the command in any of the following ways:

- **DIRECTION ACROSS**
- **DIRECTION DOWN**
- **DIRECTION BACK**
- **DIRECTION UP**

Optional Parameters:

Parameters that you can include with a command are displayed on the branch line below the main path line. For example, the partial syntax diagram for the **COPYGROUP** command:

```
                      ┌─CUTSHEET - NO──┐
►►──COPYGROUP──name───┤                ├──────────────────────────────►◄
                      └─CUTSHEET - YES─┘
```

shows you can type the command in one of these ways:

- **COPYGROUP** *name1* **CUTSHEET YES** ;
- **COPYGROUP** *name1* **CUTSHEET NO** ;
- **COPYGROUP** *name1*;

Branch lines can include branch lines of their own. An example of this is the partial syntax diagram for the **SUBGROUP** command with the optional **BIN** parameter:

```
              ┌─BIN──1─────────────┐
►►──SUBGROUP──┼────────────────────┼─────────────────────────────►◄
              └─BIN──┬─n────────┬──┘
                     ├─MANUAL───┤
                     └─ENVELOPE─┘
```

Repeating Parameters:

An arrow on a line above a parameter means that you can either repeat the parameter or enter more than one of the listed parameters. An example of this is the partial syntax diagram for the **SUPPRESSION** subcommand in the **SUBGROUP** command:

```
                   ┌─────────┐
                   ▼         │
►►──SUPPRESSION──────name────┴───────────────────────────────────►◄
```

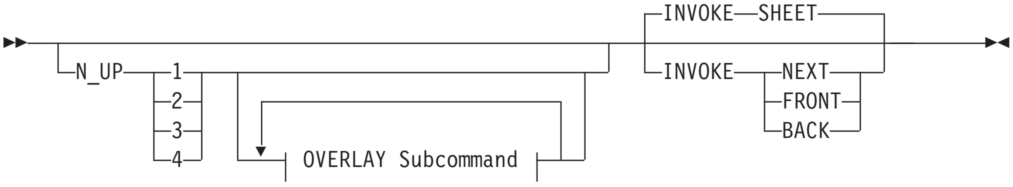
The arrow above *name* means you can include one or more field name parameters with the **SUPPRESSION** command.

Fragment Elements

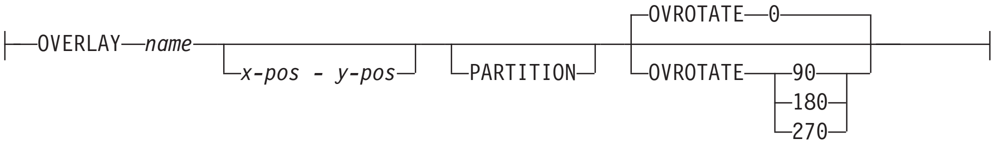
A syntax diagram can contain a section that either has too many items or groups to fit in the diagram or is used more than once. This section can be presented as a "fragment", and given a label that corresponds to the section within the main diagram. An example of this is the syntax diagram for the **FORMDEF** subcommand with its fragmented **OVERLAY** subcommand shown below:

Note: This **FORMDEF** diagram example also displays examples of some of the parameters mentioned above.

FORMDEF



OVERLAY Subcommand:



Summary of changes

This publication contains additions and changes to information previously presented in Page Printer Formatting Aid (PPFA) User's Guide, S544-5284-10. The technical additions and changes are marked with a revision bar (|) in the left margin. For additional details, see the specific PPFA command indicated.

The following information is new or updated:

- The following new bar code functions are added to the PPFA **FIELD BARCODE** page definition command:
  - Support for new bar code types REDTAG and DATABAR.
  - Support for new modification 5 (**MOD 5**) for bar code type CODE128 for the Intelligent Mail Container bar code.
  - Support for new modifications 3 and 4 (**MOD 3**, **MOD 4**) for bar code type ITL2OF5 for bearer bars on the Interleaved 2 of 5 bar code.
  - New keyword for Data Matrix 2D Parameters, **ENCODE**, to specify a Data Matrix 2D bar code encodation scheme.
  - Extending support of MODWIDTH SMALL to include the following fixed size bar codes:
    - POSTNET
    - PLANET (POSTNET MOD 4)
    - RM4SCC
    - Dutch KIX (RM4SCC MOD 1)
    - Maxicode (2DMAXI)
    - Australia Postal (APOSTAL)
- **PPFA** supports the following new object types on the **OBJECT** page definition command and on the **OBJECT** subcommand on the LAYOUT, PRINTLINE and XLAYOUT commands:
  - **PTOCA** - PTOCA text objects with an OEG
  - **MPDF**, **MPDFT** - Multiple page PDF objects
  - **MTIFF**, **MTIFFNT** - Multiple image TIFF objects
  - **AFPCTIFF** - AFPC Tag Image File Format (TIFF) subset type objects
  - **PNG –** Portable Network Graphics (PNG) type objects
  - New parameters, **OBPAGE** and **RIPPAGE**, are added to the OBJECT commands to indicate a specific page in placing or preprocessing a multiple page PDF or multiple image TIFF object.
- PPFA supports a color management resource (CMR) type of device link (DL) when defining a CMR.
- PPFA adds a new parameter, **INLINE**, to the **DOFONT** page definition command to specify a Data Object Font is to be found in an inline resource group only. This is intended to be used when complex text is present within a PTOCA text object with OEG and the user has put the data object font in an inline resource group.

Note: Not all of the functions provided by PPFA are supported in all print server licensed programs. Refer to the information for the print server licensed program that you are using to determine which functions are supported.

Part 1. What is PPFA?

Chapter 1. Introducing Page Printer Formatting Aid

Page Printer Formatting Aid is an IBM® licensed program that enables users of InfoPrint Solutions Company's Advanced Function Presentation (AFP) products to create their own formatting resources, called form definitions and page definitions. The form definitions and page definitions are stored in libraries[1] as AFP resources. Using AFP resources requires IBM Print Services Facility (PSF), AFP Conversion and Indexing Facility (ACIF), or InfoPrint Solutions Company's InfoPrint Manager, licensed programs or features, which merge resources with user data files. This merging creates a data stream for printing or viewing.

Using a form definition or a page definition created by PPFA requires you to perform three steps:

1. Write a set of PPFA commands that define how to position the data or handle the physical sheets.
2. Run PPFA to build the specified page definition or form definition and store the output as resources in a library.
3. Submit the print file using your print server, specifying the page definition and form definition needed to accomplish the desired results.

Note: Not all functions provided by PPFA are supported in all printers and printer server licensed programs. Refer to the information for the printer and printer server licensed program that you are using to determine which functions are supported.

Figure 1 on page 4 shows how form definition and page definition relate to PSF. In Figure 1 on page 4, the area inside the broken line represents steps 1 and 2. The area outside of the broken line shows how PSF merges resources with the specified print job to form a single print stream and sends it to a page printer.

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[1] For purposes of this book, the term “library” includes AIX directories as well as OS/390® & z/OS®, and VSE libraries and VM files.

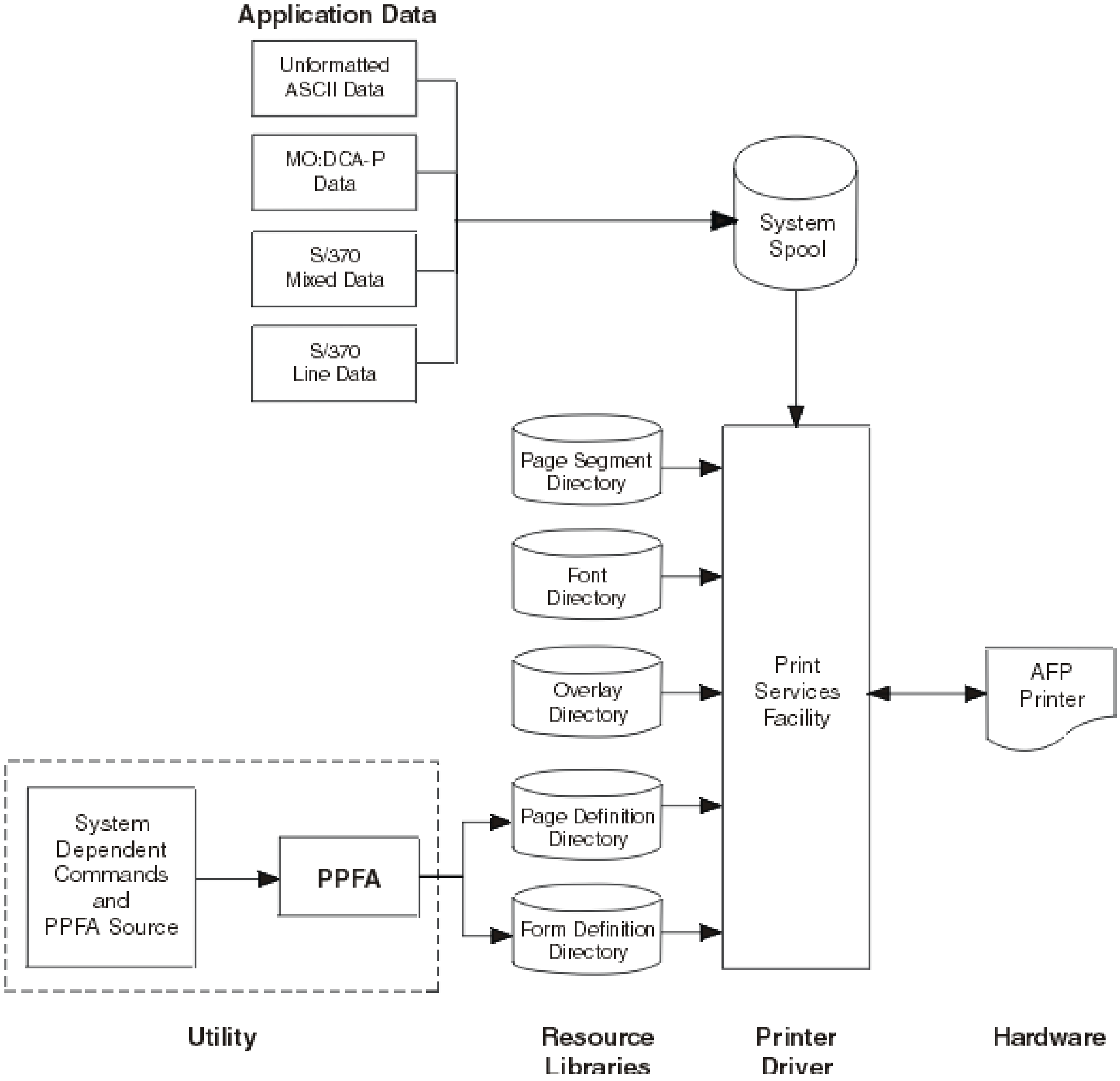


Figure 1. Form Definition and Page Definition Environment

Note: Figure 1 is a general representation for operating systems that use PPFA. Also, PSF users in the VSE, OS/390 & z/OS, and VM environments should substitute the word "Directory" for the system-specific file organization (for example, OS/390 & z/OS library).

Summary of a Form Definition

A PPFA command stream can contain form-definition commands. A *form definition* specifies how the printer controls the processing of the physical sheets of paper. In a form definition, you can specify modifications that distinguish formatting one print job from another when both are derived from the same data. Form definitions are used for all print server print files regardless of data type.

Form definitions can specify the following functions:

- Position of a logical page on a physical page
- Duplex printing
- Inclusion of overlays, which substitute for preprinted forms
- Flash (the use of a forms flash - only on 3800 printers)
- Selection of the number of copies for any page of data
- Suppression (the exclusion of selected fields of data in one printed version of a page of data but not in another)
- Jog (the offset stacking of cut-sheet output or copy marking on continuous-forms output)
- Selection among paper sources in a cut-sheet printer
- Adjustment of the horizontal position of the print area on the sheet (only on 3800 printers)
- Quality (selection among print quality levels)
- Constant (allows front or back printing of a page without variable data)
- Printing one, two, three, or four logical pages on a single side of a page
- Postprocessing controls, such as:
  - Selecting functions

    Selecting device-dependent functions defined by the postprocessing device
- Finishing operations:
  - Center Fold In
  - Corner Staple
  - Edge Staple
  - Saddle Stitch (In and Out)
  - Separation Cut
  - Perforation Cut
  - Fold
  - Z-Fold
  - Punch
  - UP3i Finishing

Summary of a Page Definition

A *page definition* specifies how you want data positioned on the logical page. A page definition can control the following functions:

- Dimensions of the logical page
- Print direction of the logical page
- Print direction of text lines and fields relative to the logical page
- Conditional processing (different formats on different pages, based on content of data)
- Text line spacing (number of lines per inch)
- Location of individual text lines and fields
- Number of text lines per page
- Page segments for inclusion in printed output
- Overlays for inclusion in printed output (positioned anywhere on the page)
- Page-ejection points
- Fonts and font rotation used on a page
- Multiple-up printing (placing more than one subpage on one side of a single sheet)
- Colors to be used (on printers that support this function)

- One and two dimensional barcodes (on printers that support this function)
- External Objects for inclusion in printed output (can be positioned anywhere on the page)
- Preloading and PreRipping of External Objects and Overlays.

Formatting Output of Different Data File Types

The basic types of data printed on the print server printers are:

Line-data files
Traditional line data
Record format line data
Mixed-data files
MO:DCA-P data files
Unformatted ASCII files (typically AIX or Windows)
XML data

Line-data files, mixed-data files, and unformatted ASCII require a page definition and a form definition. MO:DCA-P data files require only a form definition.

Line-Data Files

Line data is EBCDIC data that is arranged for printing on line printers. These records may contain line-printer control characters such as carriage control characters (CC or FCFC), table-reference characters (TRC), or only data. To compose pages for the page printer from line data, the print servers separates the incoming print records into pages according to specifications in a page definition. A page definition is always required for printing line data with the print server. You can create your own page definition or use a page definition provided with the print server. There are two types of line data: traditional and record format.

The line data input to the print server can consist of records that are fully formatted; it can consist of records that contain only the fields of data to be printed; or it can consist of records of both types. You can use the page definition resource to format fields of line data outside of the application program. Refer to *Print Server Facility for OS/390 & z/OS User's Guide, Version 3, Release 3.0* for additional information.

The following example shows two types of line data. The first type shows data arranged as it prints out and the second shows data that requires field processing.

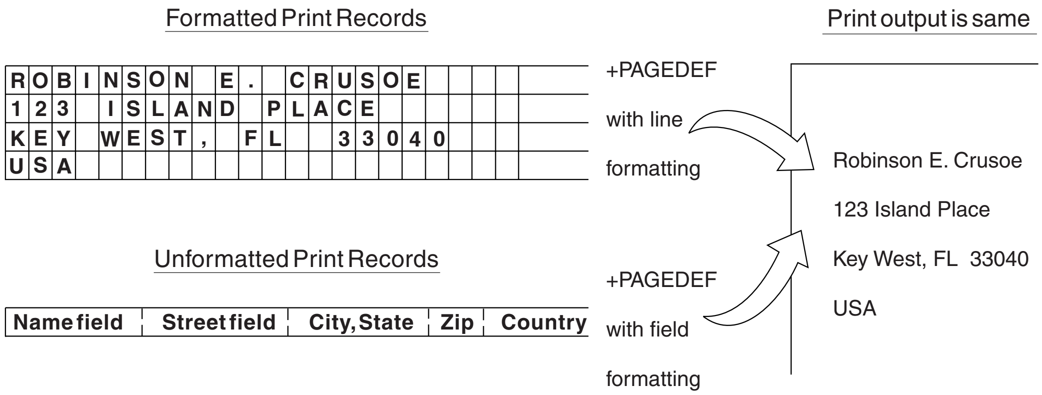


Figure 2. Formatted / Unformatted Print Records

The technique of mapping the unformatted data to locations on the output pages is known as field processing or record processing and is available through use of page-definition controls. Field processing is explained in detail in “Processing Fields” on page 45.

Traditional Line Data

Traditional line data is data formatted for printing on a line printer. Fully formatted line data can be printed on a line printer without a page definition, however all line data needs a page definition to be printed on a page printer.

A traditional line data record can contain a 1-byte carriage control character and a 1-byte table reference character followed by the data to be printed. (With a line printer, the maximum number of data bytes in a single input record is 208. With a page printer, the maximum number is 32,768 bytes). Refer to Chapter 3, “Using Page Definition Commands for Traditional Line Data,” on page 35 for additional information on using traditional line data.

Record Format Line Data

The *record formatting function* allows an application to specify a format identifier (record id) with each set of data fields (data record). The format identifier references a specific layout format in a Page Definition (PAGEDEF). At print time, each layout format (referenced by a record id in a data record) is retrieved from the PAGEDEF and used to position and format the associated data records/fields on the output page. The PAGEDEF can contain any number of layout formats. The application can use a PAGEDEF layout format to either insert an end of page when a specified last line point is exceeded on the output page or to force an end of page. Refer to Chapter 4, “Using Page Definition Commands for Record Format Line Data and XML Data,” on page 57 on using record format line data.

```
statmid    Justin Case     123 Sligo Lane   Longmont   CO 80501
ckheader
ckdata     352         01/04/07  $ 321.50   Blind Squirrel Golf
ckdata     353         01/05/07  $ 100.00   Janie's Pancake Spot
ckdata     354         01/10/07  $ 122.30   History Bookstore
ckdata     355         01/11/07  $  59.95   Kristina's Pretty Things
ckdata     356         01/15/07  $ 852.33   Pirie Racing Enterprises
ckdata     357         01/30/07  $ 500.35   Skippy's Music Center
Ckend
```

Figure 3. Example of Record Format Line Data

Mixed-Data Files

Mixed-data files consist of MO:DCA-P data and line data or unformatted ASCII data. Such files may or may not specify the beginning and ending of pages and may or may not contain page addresses and data controls for page printing. The line-data portion of such files must be formatted for page printers by page-definition controls.

MO:DCA-P Data Files

MO:DCA-P data files are formed into pages before the print server receives them. These files already contain the imbedded controls for printing on page printers. They contain such things as page addresses and data controls for page printing functions.

Note: Refer to *Mixed Object Document Content Architecture Reference* and *Advanced Function Presentation Programming Guide and Line Data Reference* for more information about MO:DCA-P data. User application programs can also generate MO:DCA-P data.

Unformatted ASCII Files

Unformatted ASCII files consist of ASCII data with no formatting controls (escape sequences) in the data.

The technique of mapping the unformatted ASCII data to locations on the output pages is known as field processing or record processing and is available through use of page-definition controls. Field processing is explained in detail in "Processing Fields" on page 45.

Unformatted ASCII data differs from unformatted EBCDIC data in that ASCII data is what is generally created on a personal computer or workstation, while EBCDIC data is what is generally created on a mainframe host, such as OS/390 & z/OS, VM, or VSE.

PPFA Concepts

The concepts of physical page, logical page, and subpage are basic to understanding form-definition and page-definition controls.

Physical Page

A *physical page* is the sheet of paper or other medium (a sheet of labels, for instance) that moves through the printer.

Logical Page

A *logical page* is the area you define in a PPFA command stream as the space on the physical page where data is printed. The logical page is positioned in relation to the *media origin*. For more information about the media origin of your printer, refer to your printer documentation. The positioning of the logical page on the sheet of paper is described in "Positioning a Logical Page on a Sheet" on page 23.

An N_UP command enables you to place one, two, three, or four logical pages on a single sheet. This is in contrast to multiple up, which enables you to place subpages on one logical page.

Subpage

A *subpage* is a part of a logical page on which line data may be placed. Subpages are used only with conditional processing. Multiple-up printing can be done with or without subpages being defined. In the page definition, multiple subpages can be placed on the physical page based on changes in the print data. A good example of this is the use of *multiple-up* printing, which is printing two or four pages on a single side of a sheet. For more information, see "Subpage Description and Processing" on page 126.

PPFA Basic Terms

The following terms have meanings that are special to PPFA:
- Printline
- Layout
- Direction

- Rotation
- Presentation
- N_UP partitions
- Modifications

Printline

Printline is a single line of text, and is the traditional command that is synonymous with the record formatting Layout command. In the formatting of line data and unformatted ASCII, a printline is normally the output generated by one record in the print file. However, printlines and print records are not the same.

PRINTLINE commands in the PPFA page definition define the number and position of printlines on a page. Each record in the print file is written to a single printline on a page. Usually, one print record is written to each printline. However, control information in the print data can specify two or more print records be written to the same printline, providing overprinting. Controls also can specify that print records skip printlines. For example, a print record may skip the remaining printlines on a page and print instead on the first printline of a new page.

Layout

Layout specifies a single line of text, and is the record formatting command that is synonymous with the traditional Printline command. In the formatting of line data and unformatted ASCII, a layout is normally the output generated by one record in the print file. However, layouts and print records are not the same.

LAYOUT commands in the PPFA page definition define the number and position of layouts on a page. Each record in the print file is written to a single layout on a page. Usually, one print record is written to each layout. However, control information in the print data can specify two or more print records be written to the same layout, providing overprinting. Controls also can specify that print records skip layouts. For example, a print record may skip the remaining layouts on a page and print instead on the first layout of a new page.

Direction

Text can be printed in four print directions. A print direction is a combination of both inline and baseline directions. For each of the directions, characters can be printed in four rotations.

The line direction is the direction in which successive characters are added to a line of text. The four line directions are:

ACROSS	Text characters are placed in a line from left to right across the page.
DOWN	Text characters are placed in a line from top to bottom down the page.
BACK	Text characters are placed in a line from right to left across the page.
UP	Text characters are placed in a line from bottom to top up the page.

The baseline direction is the direction in which successive lines of text are added to a page. The four character rotations, measured clockwise around each inline direction, for each line direction are:

0°
90°
180°

270°

For example, the text in this paragraph is printed **ACROSS** the page, and its rotation is 0°.

Figure 4 shows the four possible directions. For information about the combinations supported by the printer you are using.

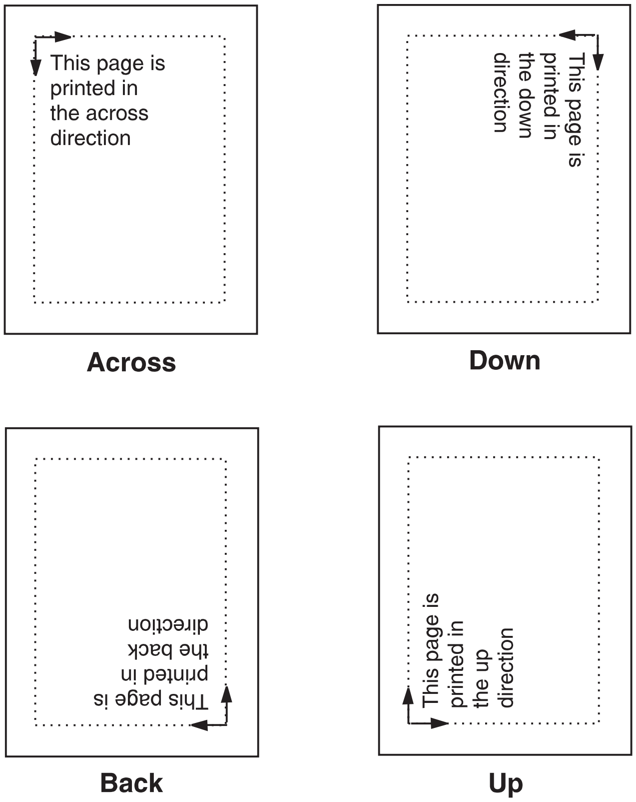


Figure 4. Baseline Direction and Inline Direction

Rotation

Individual characters can be *rotated*. Character rotation can be 0°, 90°, 180°, or 270° relative to the inline direction of the printline or field.

Note: On the 3800 printers only, character rotation differs between *bounded-box fonts* and *unbounded-box fonts*. Bounded-box fonts rotate the fonts; unbounded-box fonts are rotated by selecting the correct font.

Presentation

Presentation describes the shape of the page as it is viewed by the reader. Figure 5 on page 11 shows an example of how text is presented (positioned) on the page. There are two page presentations - *portrait* and *landscape*.

Portrait	Is designed to be viewed with the short side at the top of the page.
Landscape	Is designed to be viewed with the long side at the top of the page.

Document A - Portrait Presentation

Document B - Landscape Presentation

Figure 5. Portrait and Landscape Presentations

N_UP Partitions

Some printers allow the physical sheet of paper to be divided into equal-sized partitions. For two or three partitions, each sheet is divided along one or two lines equally spaced along the longer side of the sheet. The printer positions a logical page of print data in each partition. This enables printing multiple logical pages with different formats and modifications on a single sheet of paper.

The size and arrangement of the partitions on the sheet depends on the number of partitions and the shape and size of the paper. For two or three partitions, each sheet is divided at two or three points equally spaced along the longer side of the sheet. For four partitions, each sheet is equally divided both vertically and horizontally. See Chapter 7, "N_UP Printing," on page 147 for more information.

Modifications

Modifications are sets of form definition controls that apply to one page of a data file. With these controls, you can:

- Define the type of duplex printing to be done
- Define one, two, three, or four partitions for N_UP
- Select an overlay
- Suppress the appearance of a field
- Select the forms flash option (only for the 3800 printer)
- Specify the number of copies for a set of modifications
- Specify post-printing processing options

You can specify different sets of modifications for the same page of data in one form definition, and therefore in one print job, by a series of **SUBGROUP** commands. For example, a form definition with two **SUBGROUP** commands is said to have two sets of modifications. The same page of data is printed for each set of modifications, resulting in a slightly different output for each printing.

Definitions of Command, Subcommand, and Parameter

Commands, subcommands, and parameters are terms used throughout this publication to refer to the contents of PPFA control statements. Chapter 10, “Form Definition Command Reference” and Chapter 11, “Page Definition Command Reference” describe these commands with all their applicable subcommands.

Commands

Commands are the major controls composing form definitions and page definitions.

Subcommands

Subcommands are used to further define commands. The absence of subcommands means that the default values specified with those subcommands are used. Three command terms also appear as subcommand terms - **FONT**, **OVERLAY**, and **SUPPRESSION**. These subcommand terms further define other commands.

Parameters

You can specify *parameters* with subcommands or accept the defaults; valid entries and their defaults are shown in the command reference chapters.

Basic Controls in Traditional Line Data

The following line-printer controls may be included in a line data or unformatted ASCII file and can be used by a page definition to enable AFP functions:

- Carriage control characters
- Table-reference characters
- Record Ids

Carriage Control Characters (CC)

Carriage control characters, which control line skipping, line spacing, and page ejection on line printers, are fields within line-data and unformatted-ASCII records. They are compatible with page printers when page definitions format the printed data. In page definitions, you can specify **CHANNEL** subcommands that correspond to carriage control characters corresponding to channels 1 through 12 in the data. When you do so, the carriage control characters operate just as they do in a line-printer environment.

Note: ASCII ANSI, ANSI, and EBCDIC (machine) handle carriage control characters differently. See the **SPACE_THEN_PRINT** subcommand listed in “Subcommands (Long Form)” on page 306 for more information.

Table-Reference Characters (TRC)

Table-reference characters (TRCs) control font selection in line-data and unformatted-ASCII output. Page definitions can be used to map table-reference characters to AFP fonts for use with page printers.

For more information about Table-reference characters, see the *Advanced Function Presention: Programming Guide and Line Data Reference*, S544-3884.

Record Id

Record ids are only used with the record formatting function.

Basic Controls in Record Format Line Data

Record format line data is a new form of line data that is supported by the print server and formatted by a page definition. With this format, each data record contains a 10-byte record identifier that selects the record descriptor (RCD) in a record format page definition used to format the line data. This RCD might contain a carriage control (CC) byte.

- Carriage control characters
- Table-reference characters (not applicable in record format)

Carriage Control Characters (CC)

The CC byte is required when record format data is mixed with MO:DCA-P data, but is ignored. The CC byte is optional for record format line data at all other times, however if you enter it, you must inform the print server that it is there.

Many functions used in the line descriptor (LND) to format traditional line data are used in RCD to format record format line data. Others, such as header and trailer processing, are unique to RCDs.

Traditional line data is similar to record format line data in that neither is formatted into pages. However, traditional line data can be printed on line printers while record format line data cannot. For more information, refer to Chapter 4, "Using Page Definition Commands for Record Format Line Data and XML Data," on page 57.

Note: ASCII ANSI, ANSI, and EBCDIC (machine) handle carriage control characters differently. See the **SPACE_THEN_PRINT** subcommand listed in "Subcommands (Long Form)" on page 306 for more information.

Table-Reference Characters (TRC)

Table-reference characters (TRCs) cannot be used in record formatted line data.

Record Id

Record ids are only used with the record formatting function. They reside in the first 10 characters of each line data record, and control the layout type that is selected for each given record. These 10 characters are reserved for record ids and are not included as part of a defined field or conditional area.

Structured Fields in Line Data

Note: Structured fields are not supported with XML data.

To make use of the full function of page definitions and form definitions, MO:DCA-P structured fields may be required in the users data. The following MO:DCA-P structured fields can be included in a line-data or unformatted ASCII file (typically AIX) to activate AFP functions:

- Invoke Data Map
- Invoke Medium Map
- Include Page Segment
- Include Page Overlay
- Include Object
- Include Presentation Text (PTX)
- No Operation (NOP)

Note: For information about mixed mode, see the *Advanced Function Presention: Programming Guide and Line Data Reference*, S544-3884.

Invoke Data Map

Add the Invoke Data Map structured field to the line-data or unformatted ASCII file at a point that requires switching from one page format to another. The term "data map" is the name used for the term "page format" in PSF publications and PSF terminology.

Invoke Medium Map

Add the Invoke Medium Map structured field to the line-data or unformatted-ASCII file at a point that requires switching from one copy group to another. The term "medium map" is the name used for the term "copy group" in PSF publications and PSF terminology.

Include Page Segment

Position the Include Page Segment structured field within the line or unformatted ASCII data for placing the page segment on the page.

Include Page Overlay

Position the Include Page Overlay structured field within the line or unformatted ASCII data for placing the overlay anywhere on the page.

Include Object

Position the Include Object structured field for placing an object containing other object types (for example, IOCA or BCOCA™) for placing the object anywhere on the page.

Presentation Text

A presentation text object can be included in line data using the Presentation Text (PTX) structured field which is a self contained object consisting of line spacing, page margin, data position and font settings. Refer to the *AFP Programming Guide and Line Data Manual*, S544-3864 and the *Presentation Text Object Content Architecture Reference*, SC31-6803 for additional information.

No Operation

A No Operation (NOP) structured field can be placed in the line data stream. This can be used to insert information, such as a comment, into the data stream.

Normal Duplex and Tumble Duplex

Some page printers can print on both sides of a sheet, which is called *duplex* printing. Duplex printing can be done in four ways:

Normal duplex
Tumble duplex
Rotated normal duplex
Rotated tumble duplex

In normal duplex, both sides have the same orientation, as in most books. In tumble duplex, the back of each page is upside down with respect to the front of the page: the top of one side of the sheet is at the same edge as the bottom of the other side. These two types of duplex allow you to specify top binding or side binding of the printed pages.

Duplex also involves the commands **RNORMAL** (rotated normal) and **RTUMBLE** (rotated tumble), which are used with landscape-presentation pages to specify the type of duplex printing. See Figure 13 on page 30 and Figure 14 on page 31 for illustrations of duplex printing.

Part 2. Examples of Using PPFA

Chapter 2. Using Form Definition Commands

A form definition is a resource, used by the print server, that specifies how the printer controls the processing of the sheets of paper. With form definitions, you can perform the tasks listed in Table 1.

Table 1. Form Definition Tasks

Tasks	Location of Example
Creating a form definition	"Commands Required to Create a Form Definition" on page 22
Positioning a logical page	"Positioning a Logical Page on a Sheet" on page 23
Specifying landscape presentation	"OFFSET Subcommand with Rotated Print Direction" on page 24
Specifying copies and electronic overlays	"Specifying Copies and Electronic Overlays" on page 25
Printing constant forms	"Printing Constant Forms" on page 26
Duplex printing in two orientations	"Duplex Printing" on page 27
Printing portrait and landscape	"Duplex Printing in Portrait and Landscape Presentations" on page 29
Specifying the page presentation on continuous-forms printers	"Specifying Page Presentation on Continuous-Forms Printers" on page 32

Copy Groups and Subgroups

A single form definition can contain several subsets of page controls, called *copy groups*. Copy groups define each physical page in the file. When you are printing jobs in duplex, the copy group defines both sides of the physical paper. Copy groups, in turn, can contain up to 127 *subgroups*, each of which creates a different set of modifications for the same page of data.

A series of copy groups can be used where either the data or the printing requirements call for a variety of page control schemes. Part of the file can be printed from one (bin) paper source and part from another. Part can be printed duplex; part can be printed simplex. Duplex commands can be specified for a printer that does not support this function. This command treats the two adjacent pages as duplexed. A variety of controls can be contained in one form definition having several copy groups.

You can control the following options within a copy group:

- Position of the logical page on a sheet of paper
- Duplex printing
- Type of cut-sheet paper to be printed on (by choosing between paper input sources in page printers that have more than one paper source)
- Offset stacking or copy marking of parts of a print job in the output stacker
- Printing one, two, three, or four logical pages on a single side of a sheet
- Vendor-attached devices for post-processing functions to be performed on the sheet

- Print-quality level

To access a new copy group within a form definition you can:
- Add to your data file an Invoke Medium Map structured field immediately before the page of data that requires the new copy group.
- Use a page definition that specifies conditional processing. When you access a new copy group, printing begins on the next physical sheet of paper.

For more information on the Invoke Medium Map structured field, refer to *Mixed Object Document Content Architecture Reference*.

Subgroups allow the same page of data within a file to be printed more than once, using different sets of modifications each time the page is printed. One example is the printing of an invoice and a packing list from the same records in a data file.

The following modifications to the page of data can be specified in a subgroup:
- Selection of suppressed fields for the page
- Selection of overlays used with the page
- Selection of forms flash with the page (only on the 3800 printer)
- Selection of the modification for front, back, or both sides of a sheet
- Selection of the number of copies of the subgroup to print
- Selection of the input bin

Commands Required to Create a Form Definition

The following simplified command stream shows the proper nesting of commands and the sequence in which the commands must be entered when you are creating a form definition:

```
 SETUNITS ]
FORMDEF
[SUPPRESSION ...]
[COPYGROUP ]
  [OVERLAY ...]
  [SUBGROUP ...]
[COPYGROUP ]
  [OVERLAY ...]
  [SUBGROUP ...]
```

Notes:
1. If the form definition has only one copy group, the **COPYGROUP** command can be omitted. The **OVERLAY** command then follows any **SUPPRESSION** command.
2. Indentations are used to improve readability.
3. Complete definitions of commands are in Chapter 10, “Form Definition Command Reference,” on page 223.

Command Nesting Rules

1. **SUPPRESSION** commands must be specified immediately after **FORMDEF** commands.
2. **SUBGROUP** commands are specified under their associated **COPYGROUP** command or under the **FORMDEF** command.
3. **OVERLAY** commands are specified immediately after **COPYGROUP** commands.

4. The first **COPYGROUP** command can be omitted in a form definition if the form definition has only one copy group, and if it contains no **OVERLAY** commands.
5. A **SETUNITS** command can be placed anywhere in the PPFA command stream and is in effect until another **SETUNITS** command is encountered.
6. More than one of each command can appear under one form definition.
7. If an **OVERLAY** occurs outside of a **COPYGROUP** (immediately after the **FORMDEF**), PPFA generates a **COPYGROUP** with the **FORMDEF** name. This becomes the first **COPYGROUP** and may not be the desired effect. If this occurs, PPFA issues a warning message .

Positioning a Logical Page on a Sheet

The example in this section shows how the **OFFSET** subcommand is used to position the logical page on the physical sheet. A logical page is the area on a sheet of paper where all printing occurs. You establish the *logical page origin*, the point nearest the media origin, with the **OFFSET** subcommand. The **OFFSET** subcommand requires two coordinates and may have four. The first *x* and *y* coordinate defines the position on the front of the sheet, and the second *x* and *y* coordinate defines the position on the back of the sheet. A sample form definition that specifies the logical page position for a simplex sheet is:

```
FORMDEF ABCD
        OFFSET 1 IN 1 IN ;
```

Note: The 1 IN 1 IN is an abbreviation for 1 INCH 1 INCH. PPFA supports a number of different units of measurement formats. See “Units of Measurement” on page 220 for all the different formats.

The example places the logical page origin one inch to the right of and one inch down from the media origin.

Figure 6 on page 24 shows the meaning of the *x* and *y* coordinates. In writing an **OFFSET** subcommand, the first parameter specifies *x*; the second parameter specifies *y*. If the *x* and *y* are repeated for the offset of the back side of the physical page, the same applies. The *x* defines the horizontal offset; the *y* defines the vertical offset. In this example, the logical page direction is **ACROSS**. The arrows within the logical page indicate the inline direction for text on the page. The lines of text are added according to the baseline direction.

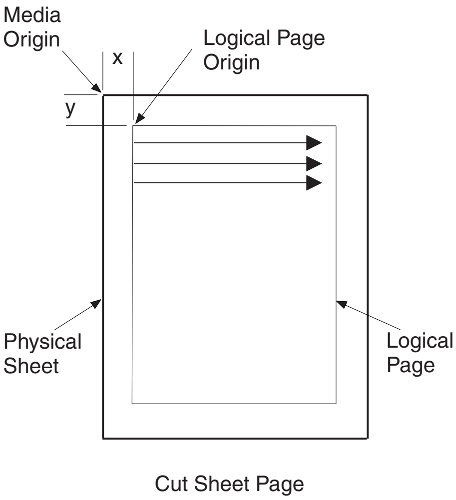


Figure 6. Origin of Logical Page

Figure 7 shows the meaning of *x* and *y* in a logical page specification for a 3900 sheet. The 3900 sheet does not have an unprintable area, but **FORMDEF**s supplied with the print server have a 1/6 inch offset.

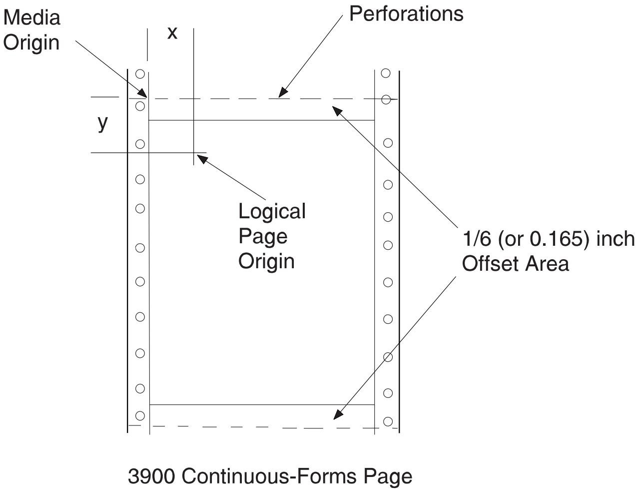


Figure 7. Origin of a Logical Page on a 3900 Sheet

OFFSET Subcommand with Rotated Print Direction

Figure 8 on page 25 shows that the media origins and logical page origins do not change when the print direction of the page changes, although the way you view the page does change. The arrows within the logical page show the **DOWN** print direction—producing landscape page presentation.

Be careful to coordinate form definitions and page definitions when you change between portrait and landscape presentations.

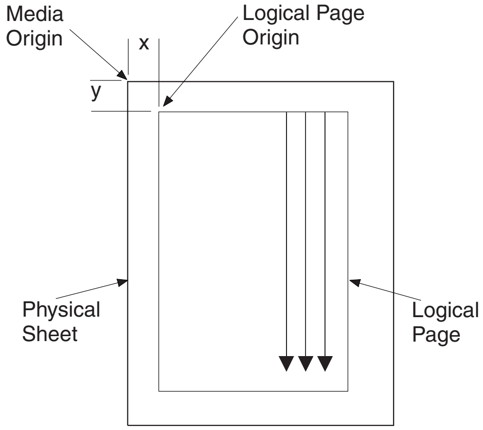


Figure 8. The Meaning of **OFFSET** *Parameters within a Landscape Page*

Specifying Copies and Electronic Overlays

This example shows how to specify different electronic overlays in different subgroups. The electronic overlays you specify are created separately, using a program such as IBM Overlay Generation Language/370, and are stored as resources in the overlay library. No positioning controls are needed in the form definition with an overlay; the overlays are merely named. The overlay contains its own positioning data relative to the physical sheet. A form definition containing two overlays might look like this:

```
FORMDEF SLSCOM ;
  COPYGROUP SLSCOM ;
    OVERLAY SLSRPT  M1001 ;   /*LOCAL NAME AND USER-ACCESS NAME*/
    OVERLAY M1002 ;           /*USER-ACCESS NAME ONLY          */
    SUBGROUP COPIES 2
             OVERLAY SLSRPT ;
    SUBGROUP COPIES 3
             OVERLAY M1002 ;
```

The steps to write this form definition are:

1. Create a copy group.
   a. Write a **COPYGROUP** command.
   b. Write an **OVERLAY** command for each overlay.
2. Create two subgroups by writing two **SUBGROUP** commands. Each subgroup contains an **OVERLAY** subcommand naming one of the selected overlays.

   Note: The overlays must be named in each copy group.

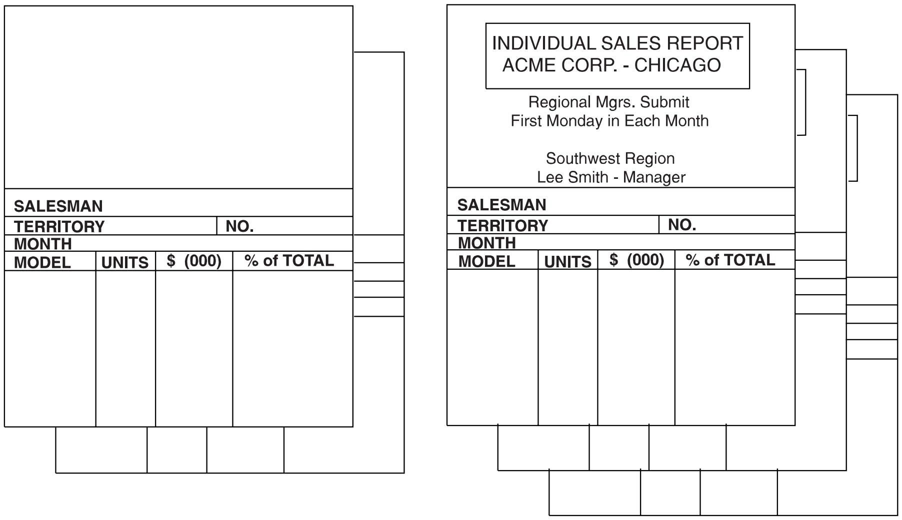
Overlay Names

To identify overlays by name, you must be aware of the three possible names for an overlay: a local name (SLSRPT) and two system names (M1001, O1M1001). The *local name* is used only within the PPFA command stream; its use is optional. An example of this is SLSRPT in the first **OVERLAY** command of the previous sample command stream.

The *system name* identifies an overlay in the library. It has two forms: the *user-access name* (M1001 in the sample set of commands) and the *library-resource name*. Of these, you use only the user-access name. PPFA automatically adds the O1 overlay prefix to the user-access name, which identifies the resource in the library. An overlay referenced through a form definition built with PPFA, therefore, must begin with the O1 prefix. An example of the result is O1M1001, the library-resource name.

You can make up your own local name for an overlay. However, the local name must be used in the **OVERLAY** subcommand in the subgroup if it is used in an **OVERLAY** command for the copy group. If it is not, the subgroup must specify the user-access name, as has been done for overlay M1002 in the example.

This example, specifying copies and electronic overlays, also specifies the number of copies of each subgroup. More than one copy of printed output can be requested by placing the **COPIES** subcommand and the number of copies of the subgroup desired in the **SUBGROUP** command. This example specifies that two copies of the first subgroup and three copies of the second subgroup are to be printed. See Figure 9, which shows the result of printing a job that includes overlays as specified in the sample command stream at the beginning of this example.



Overlay SLSRPT

Overlay M1002

Figure 9. Two Electronic Overlays Incorporated into Two Subgroups

Printing Constant Forms

This example shows how to specify the constant-forms function using the **CONSTANT** command. The constant-forms function allows you to print overlays or a forms flash on blank pages without adding blank pages to your print job. Instead, the **CONSTANT** command generates blank pages on which to print the requested overlays and forms flash. These pages are called *constant forms* because no variable data from the print file is printed on the pages.

You specify the **CONSTANT** command for an entire copy group; you identify the overlays and forms flash in the subgroups of the copy groups.

The sample form definition XMPXXX shown below specifies that overlay XMP be printed on the back of each sheet with no variable data from the print job. The data from the print file is printed only on the front side of each sheet.

```
FORMDEF XMPXXX
        REPLACE YES
        DUPLEX NORMAL ;
  COPYGROUP XMPXXY
            CONSTANT BACK ;
    OVERLAY XMP;
    SUBGROUP  FRONT ;
    SUBGROUP  BACK
            OVERLAY XMP;

PAGEDEF XMPXXX
        REPLACE YES ;
  FONT  NORMALFONT  GT10 ;
  PAGEFORMAT XMPXXX  ;
    PRINTLINE CHANNEL 1 REPEAT 20
            POSITION 1 1 ;
```

The steps to write this form definition are:

1. Create a copy group.
   a. Specify duplex printing.
   b. Specify printing of a constant form as the back side of each sheet.
   c. Write an **OVERLAY** command.
2. Create two subgroups by writing two **SUBGROUP** commands. The subgroup for the back side specifies the overlay to be printed.

Note: If you do not specify an overlay in the subgroup for the back, the back side of each sheet will be blank.

Duplex Printing

Printing on both sides of a sheet (duplex printing) can be done in two ways: by the use of the **FRONT** and **BACK** subcommand combination or by the use of the **BOTH** subcommand. If **FRONT** and **BACK** are chosen, the number of copies requested for each must be the same.

To demonstrate some of the functions available for duplex printing, assume you want to print a six-page data file (a simplified version is shown in Figure 10).

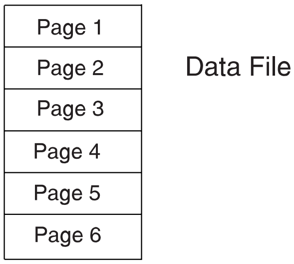


Figure 10. Six-Page Formatted Data File

Assume, too, that the file is already composed and formatted, so only a form definition is needed. The first form definition follows:

```
FORMDEF ABCD
        DUPLEX NORMAL ;
  OVERLAY AB ;
  SUBGROUP FRONT
           OVERLAY AB ;
  SUBGROUP BACK ;
```

In this command stream, form definition ABCD contains two subgroups, one specified with a **FRONT** subcommand and the other with a **BACK** subcommand.

By including a pair of **FRONT** and **BACK** subcommands within the copy group, you can specify that the front and back of printed sheets are to be controlled by different subgroups. The purpose of this is to allow modifications (overlays or suppressions, for example) to be separately specified for the front and back of sheets. Figure 11 shows the result of using this control where the front sheets have a header (OVERLAY AB) that the backs do not have.

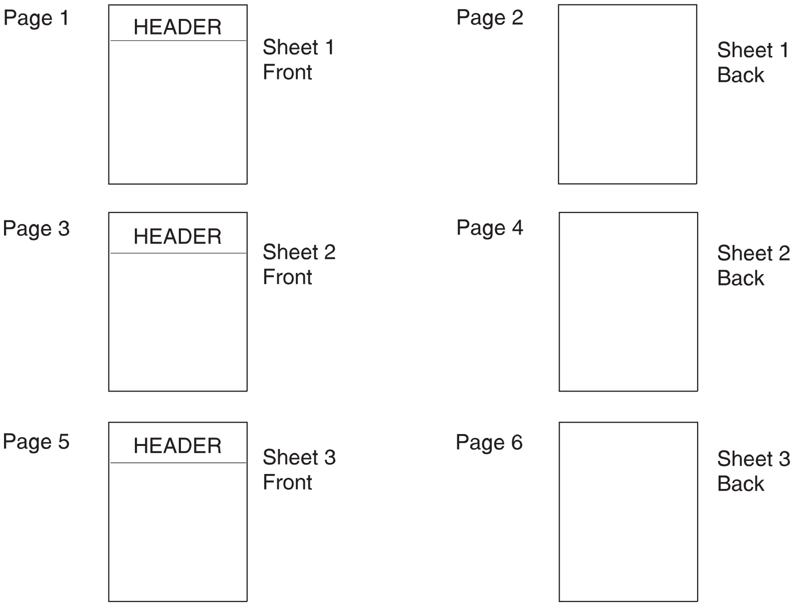


Figure 11. Result of Using a Pair of **FRONT** *and* **BACK** *Subgroups*

The rules of the **FRONT** and **BACK** subcommands are:

- **FRONT** and **BACK** subgroups must be specified in pairs.
- Subgroups specifying **FRONT** must always immediately precede subgroups specifying **BACK**.
- **FRONT** and **BACK** subgroups must agree in the number of copies.

The **BOTH** subcommand also can be used with a form definition or a copy group that specifies duplex printing. An example of this type of form definition is:

```
FORMDEF EFGH
        DUPLEX NORMAL ;
  SUBGROUP BOTH
           COPIES 2 ;
```

The form definition EFGH contains only one **SUBGROUP** command.

Notes:

1. The copy group actually contains the subgroup, but if a form definition contains only one copy group, the copy group need not be specified.
2. With the **BOTH** subcommand, you specify only one subgroup: both sides of all sheets have the same modifications.
3. The above form definition does *not* put the same data on the front and back of the same sheet. Internally to PPFA, a single **BOTH** subgroup actually produces two subgroups. As a result, two pages of data (one for each internal subgroup)

are processed before copy number 2 is made. For more information about this topic, see "SUBGROUP Command" on page 296.

Figure 12 shows a sample print resulting from using the FORMDEF EFGH specifying **BOTH** to control the printing of the six-page (2 copies) data file.

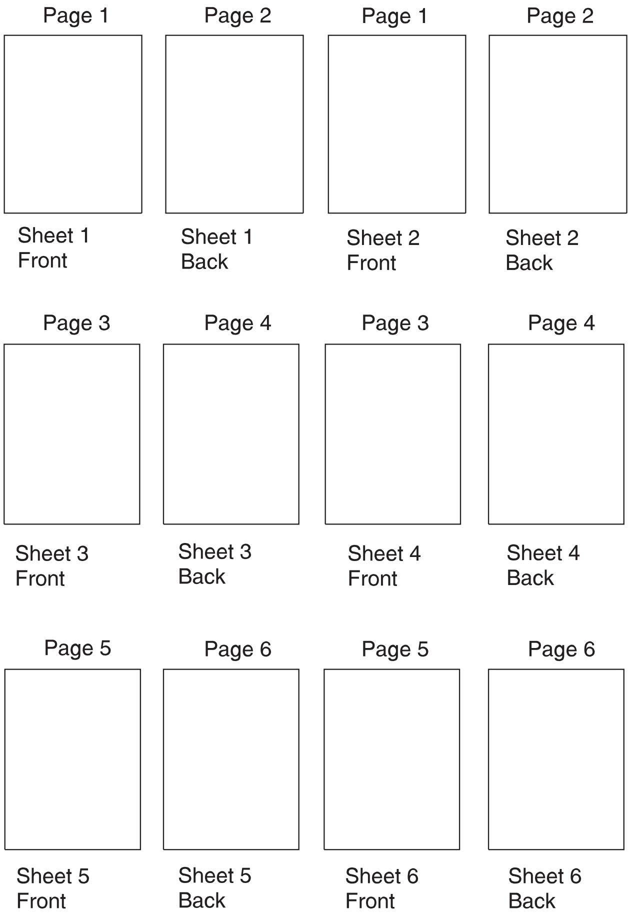


Figure 12. Form Definition EFGH Using **DUPLEX** *with* **BOTH**

Duplex Printing in Portrait and Landscape Presentations

Duplex printing with PPFA and your print server printers offers several other options. This example shows the combination of portrait and landscape presentations with normal and tumble duplex printing.

Note: The terms normal, tumble, portrait, and landscape are used in this example. They are explained in this chapter and in the Glossary.

NORMAL and **TUMBLE** are parameters of a **DUPLEX** subcommand. For example, a form definition specifying **DUPLEX NORMAL** could be written this way:

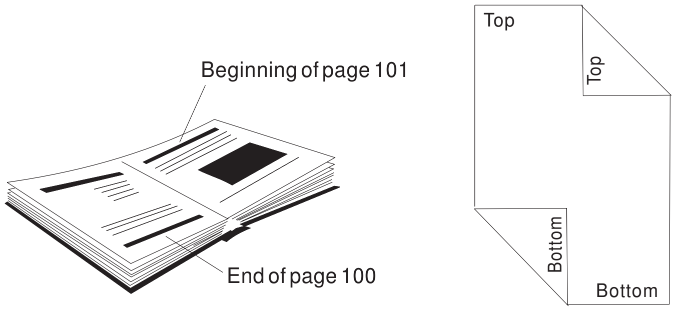
```
FORMDEF ABCD ;
  COPYGROUP ABCD
            DUPLEX NORMAL ;
    SUBGROUP BOTH
             COPIES 1 ;
```

Document A in Chapter 10, “Form Definition Command Reference,” on page 223 shows the result of a **DUPLEX NORMAL** specification in the portrait presentation. Document D shows the result of the same form definition when a landscape presentation is specified. The printout in landscape presentation is really in a tumble-duplex format, having the tops (of the front side) and the bottoms (of the back side) of the logical pages toward the same edge of the sheet.

Although tumble duplex can be specified in this manner for landscape pages, another parameter, **RTUMBLE** (rotated tumble), exists to make the form definition look more sensible for use in landscape print jobs. It also produces the results shown in Figure 13, depending on whether the form definition called for portrait or landscape presentation. For landscape, the form definition should be written as follows:

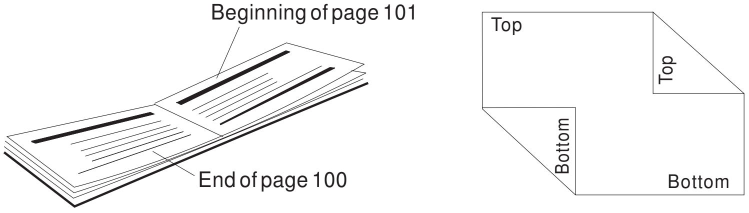
```
FORMDEF ABCD
   PRESENT LANDSCAPE ;
  COPYGROUP ABCD
           DUPLEX RTUMBLE ;
    SUBGROUP BOTH
           COPIES 1 ;
```

Note: The example presented is for continuous printers. You must use **N_UP** for cut-sheet printers. In Chapter 10, “Form Definition Command Reference,” on page 223, see the **PRESENT** subcommand of **COPYGROUP**.



Document A - Portrait

DUPLEX NORMAL Sheet



Document D - Landscape

DUPLEXTUMBLE Sheet
(RNORMAL)

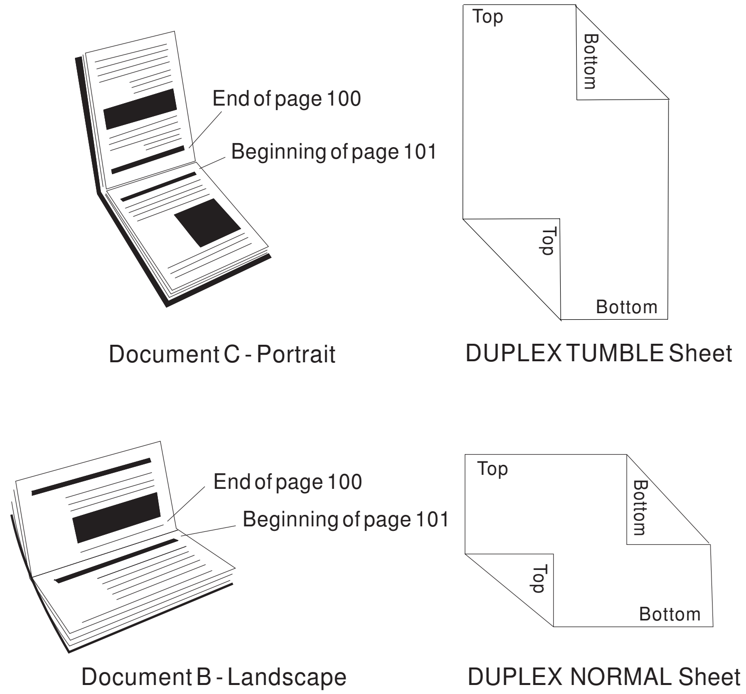
Figure 13. **DUPLEX NORMAL***: Portrait and Landscape Presentation*

The **DUPLEX NORMAL** and **DUPLEX RTUMBLE** controls actually produce the same result on the physical page. **RTUMBLE** is used to maintain an association between duplex specifications and logical page print direction. The same relationship exists between the **RNORMAL** and the **TUMBLE** parameters as exists between the **NORMAL** and the **RTUMBLE** parameters; that is, within the two sets the terms are interchangeable.

For example, you could write a form definition using **DUPLEX TUMBLE** as follows:

```
FORMDEF DEFG ;
  COPYGROUP DEFG
            DUPLEX TUMBLE ;
    SUBGROUP BOTH
             COPIES 1 ;
```

Documents C and B in Figure 14 are the results, depending on how page definition direction is specified to achieve either a portrait page or a landscape page.



Document C - Portrait

DUPLEX TUMBLE Sheet

Document B - Landscape

DUPLEX NORMAL Sheet
(RTUMBLE)

Figure 14. Result When Either **TUMBLE** *or* **RNORMAL** *Is Specified*

To help you remember, use Table 2.

Table 2. Duplex Specifications

If the form definition duplex specification is...	and if the page definition direction is...	then, the duplex printing result is...
DUPLEX NORMAL	**ACROSS** or **BACK**	normal duplex - portrait
DUPLEX RTUMBLE	**DOWN** or **UP**	tumble duplex - landscape
DUPLEX TUMBLE	**ACROSS** or **BACK**	tumble duplex - portrait
DUPLEX RNORMAL	**DOWN** or **UP**	normal duplex - landscape
Note: Other control combinations are not recommended.		

Specifying Page Presentation on Continuous-Forms Printers

This example shows how to specify the page presentation (portrait or landscape) on printers that use continuous-forms paper. The page presentation is specified in the form definition using the **PRESENT** subcommand in conjunction with the **DIRECTION** subcommand.

The **PRESENT** subcommand specifies how your pages will be presented when they are printed and has two valid values: **PORTRAIT** and **LANDSCAPE**.

The **DIRECTION** subcommand specifies the inline direction in which your pages have been formatted by the page definition (see "FIELD Command" on page 354) or by the program formatting the data. The **DIRECTION** subcommand has two valid values: **ACROSS** and **DOWN**.

The conditions in which you should use these subcommands and some conditions in which they are not required are described below. For more information about how these subcommands work with data sent to specific printers, refer to the appropriate printer documentation.

In order to understand the description that follows, you must be aware of the difference between the two types of continuous forms: *narrow* and *wide.* Narrow forms are forms that have perforations on the shorter edge of the paper and tractor holes on the longer edge. Wide forms are forms that have perforations on the longer edge of the paper and tractor holes on the shorter edge. The two types of forms are illustrated in Figure 15.

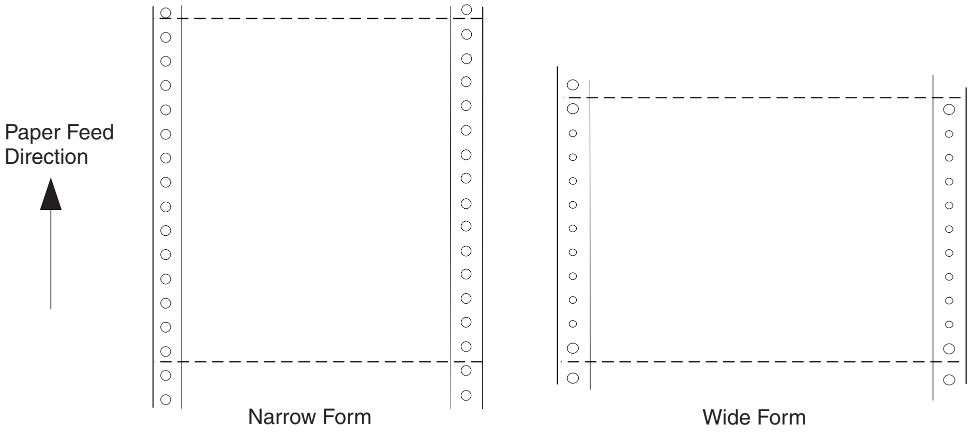


Figure 15. Narrow and Wide Continuous Forms

When to Use the PRESENT and DIRECTION Subcommands

You should use the **PRESENT** and **DIRECTION** subcommands if you are building a form definition that will be used:

- With wide forms on an InfoPrint Solutions Company continuous forms printer when the print data has been formatted in the **DOWN** print direction (see "The DOWN Direction for Continuous Forms Printers" on page 33)
- When you do not know which type of form (narrow or wide) will be used on an InfoPrint Solutions Company continuous forms printer (see "The DOWN Direction for Continuous Forms Printers" on page 33)

Note: References to an InfoPrint Solutions Company continuous forms printer point of origin also applies to all continuous-forms printers except the 3800.

When the PRESENT and DIRECTION Subcommands Are Not Required

You do not need to use the **PRESENT** and **DIRECTION** subcommands if you are building a form definition that will be used:

- With cut-sheet printers only
- With narrow forms only
- With the 3800 printer only
- With print data that has been formatted in the **BACK** direction by the page definition or the program formatting the data

The DOWN Direction for Continuous Forms Printers

If your data has been formatted in the **DOWN** print direction for landscape page presentation and is to be printed on wide forms on an InfoPrint Solutions Company continuous forms printer, you must specify **LANDSCAPE** on the **PRESENT** subcommand to produce readable output.

If **PRESENT LANDSCAPE** and **DIRECTION DOWN** are not specified on the **FORMDEF** command, the data is printed in the landscape presentation; however, the data will be upside down, as shown in Figure 16. The data is upside down in this case because the media origin for an InfoPrint Solutions Company continuous forms printer is located on the same corner of the form, regardless of whether a narrow or wide form is being used (see Figure 16).

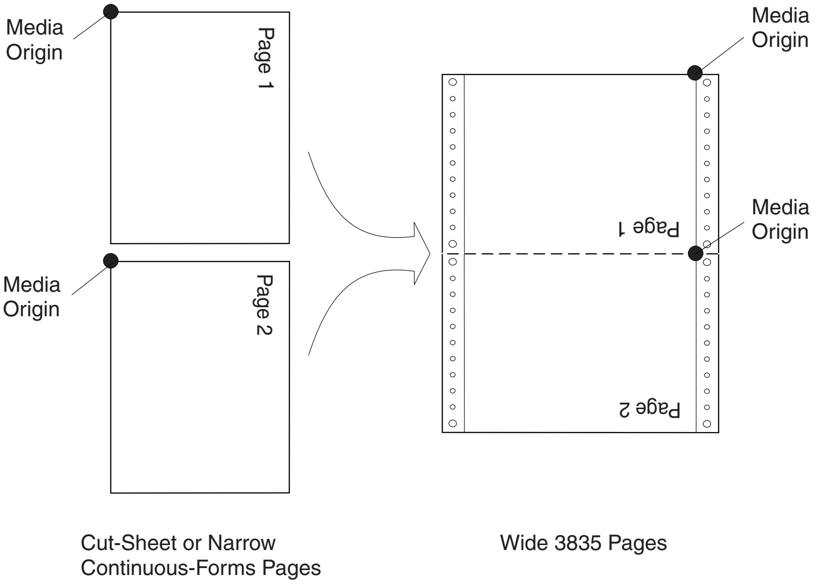


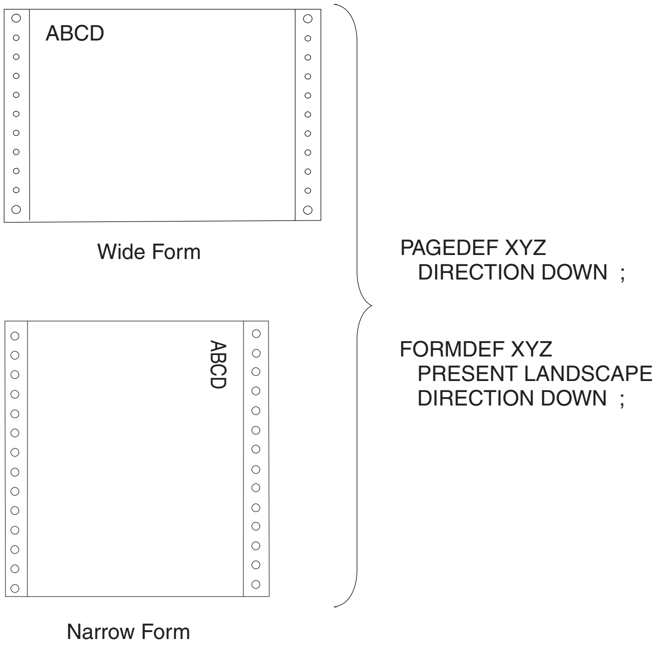
Figure 16. The Results of Not Specifying **PRESENT LANDSCAPE** *and* **DIRECTION DOWN** *on an InfoPrint Solutions Company Continuous Forms Printer*

If **PRESENT LANDSCAPE** and **DIRECTION DOWN** are specified on the **FORMDEF** command, the data will be printed as shown in Figure 17. In this example, line data is formatted using a page definition.

PRESENT LANDSCAPE and **DIRECTION DOWN** can also be specified for data formatted in the **DOWN** print direction that will be printed on narrow forms.

Although **PRESENT LANDSCAPE** and **DIRECTION DOWN** do not need to be specified in this case in order to produce readable output, specifying them enables you to use the same form definition regardless of whether the data will be printed on wide forms or narrow forms.

Note: If you are building a form definition that can be used with both wide and narrow forms, remember that the left margin as viewed by the reader becomes the top margin from the printer's perspective (and vice versa). Because many printers have an unprintable area at the margins, you should position the logical page using the **OFFSET** subcommand in the form definition, so data will not be placed in the unprintable area on either wide or narrow forms.



```
PAGEDEF XYZ
  DIRECTION DOWN  ;

FORMDEF XYZ
  PRESENT LANDSCAPE
  DIRECTION DOWN  ;
```

Figure 17. The Results of Specifying **PRESENT LANDSCAPE** *and* **DIRECTION DOWN** *on an InfoPrint Solutions Company Continuous Forms Printer*

Print Quality Control

If your printer has more than one print-quality selection, you can specify different levels of print quality. For more information refer to the manual for your printer.

Chapter 3. Using Page Definition Commands for Traditional Line Data

A *page definition* specifies how you want data positioned on the logical page.

A page definition is a resource used by print servers to define the rules of transforming line data and unformatted ASCII into composed pages and text controls for printing. With page definitions, you can perform the tasks listed in Table 3.

Table 3. Page Definition Tasks

Tasks	**Location of an Example**
Creating a page definition	"Page Definition Command Nesting" on page 36
Defining logical page size	"Defining Logical Page Size" on page 36
Positioning data on a logical page	"Positioning the First Line of Data" on page 37
Changing the print direction	"Changing Logical Page Print Direction" on page 39
Printing line data	"Printing Line Data on a Print Server Printer" on page 41
Processing fields	"Processing Fields" on page 45
Changing fonts	"Varying Fonts on a Page" on page 47
Printing in different directions	"Printing Lines in Two Directions on a Page" on page 50
Printing fields in two directions	"Printing Fields in Two Directions on the Same Page" on page 50
Rotating fonts	"Rotating Fonts" on page 51
Printing kanji	"Using Traditional Kanji Formatting" on page 53
Printing multiple up	"Printing Multiple-Up Pages" on page 53

Page Formats within Page Definitions

Just as form definitions can include more than one copy group, page definitions can include several *page formats*. Page formats use the same subcommands (except **REPLACE**) as page definitions, and if a subcommand is specified in a page format, it overrides the value specified in the page definition for the page format. A single page definition may contain multiple page formats. If pages in a file are to be formatted differently, specify more than one page format in your page definition. Within a page definition, page formats are generated in the order in which they are specified.

Using more than one page format to control different pages requires one of the following:

- Adding the Invoke Data Map structured field to the data file each time you want to change page formats
- Using conditional processing.

Refer to *Advanced Function Presentation: Programming Guide and Line Data Reference* for more information about the Invoke Data Map structured field.

Page Definition Command Nesting

The following simplified command stream shows the proper nesting of commands and the order in which they must be entered when you create a page definition:

```
[SETUNITS]
PAGEDEF
  [FONT]
  [OBJECT]
  [PAGEFORMAT]
    [TRCREF]
    [OBJECT]
    [SEGMENT]
    [OVERLAY]
     PRINTLINE
      [FIELD]
      [CONDITION]
    [ENDSUBPAGE]
[SETUNITS]
```

Notes:

1. Brackets enclosing a command mean the command is optional.
2. A command and its subcommands end with a semicolon.
3. Indentations are used to improve readability.
4. Complete definitions of all commands are included in Chapter 11, “Page Definition Command Reference,” on page 301.

Command Nesting Rules

1. **FONT** commands must be specified immediately after **PAGEDEF** commands.
2. A **SETUNITS** command can be specified anywhere in the PPFA command stream and is in effect until another **SETUNITS** command is specified.
3. **OBJECT** commands may appear after the **FONT** command, before any **PAGEFORMAT** command (global objects) or after a specific **PAGEFORMAT** command. A global object is defined for all page formats in the page definition. Otherwise the object is just defined for the **PAGEFORMAT** in which it is specified.
4. **TRCREF**, **SEGMENT**, and **OVERLAY** commands must be specified under their associated **PAGEFORMAT** command.
5. The first **PAGEFORMAT** command can be omitted in a page definition, if the page definition has only one page format.
6. At least one **PRINTLINE** command is required.

Defining Logical Page Size

“Positioning a Logical Page on a Sheet” on page 23 shows how to establish the origin point of a logical page, relative to the media origin on a sheet of paper, using the **OFFSET** subcommand. The following example shows you how to establish the width and height of the logical page relative to this origin point. This example illustrates how the dimensions of a logical page are determined by form definitions and page definitions.

```
FORMDEF ABCD
        OFFSET (1)(2) ;
PAGEDEF ABCD
        WIDTH  (3)
        HEIGHT (4)  ;
        PRINTLINE  ;
```

Note: The parenthetical numbers represent dimensions. Figure 18 shows how these dimensions relate to the logical page.

Normally, all parameters consist of a number and a unit of measurement, for example, 6 IN. (See "Units of Measurement" on page 220 for information on units that are available.) Numbers can be specified with up to three decimal places. The **PRINTLINE** command is included because at least one is required for all page definitions; see "PRINTLINE Command" on page 465 for more information.

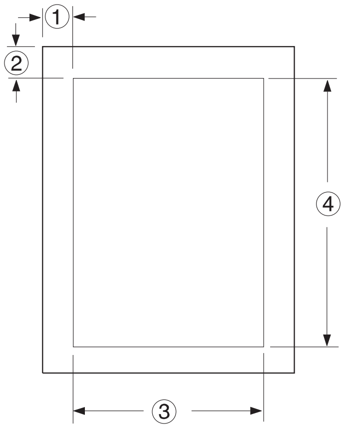


Figure 18. Logical Page Dimensions

The **OFFSET** subcommand (1) (2) in the sample form definition establishes the corner or origin of the logical page relative to the physical sheet. The **WIDTH** and **HEIGHT** subcommands, (3) and (4), specify the dimensions of the logical page relative to the logical page origin.

Note: Be careful not to define a logical page larger than the physical sheet. PPFA does not check the size of the physical sheet.

"Positioning the First Line of Data" shows you two ways to position the first line of data on the page.

Positioning the First Line of Data

The previous section showed you how to define the size of a logical page. The next two examples show you how to position the first line of data inside the logical page, using the **LINEONE** subcommand. This subcommand position is relative to the logical page origin, as shown in Figure 19 on page 38. The two coordinates, (1) and (2), of the **LINEONE** parameter define the starting point for the first line of text.

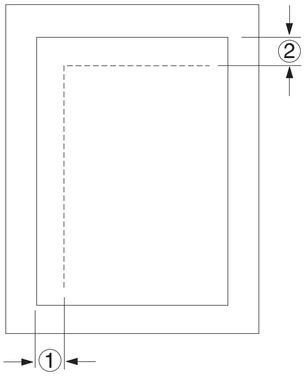


Figure 19. **LINEONE** *Coordinates*

This starting point works with the **POSITION**, **MARGIN**, and **TOP** subcommands (of the **PRINTLINE** command) to position lines of print on a page.

The defaults for **LINEONE** are:

x = 0,
y = 80% of one line space from the top of the logical page:
  80% of 1/6 inch if lines per inch (lpi) = 6,
  80% of 1/8 inch if lpi = 8, and so on.

These defaults leave room for the character ascenders in the first line of text.

Note: PPFA subtracts one logical unit (L-unit) from the *y* value to compensate for the fact that the printer counts L-units beginning with the number 0. Therefore, if you specify the offsets to the first line in L-units (**PELS** is the measurement command for L-units) using the **LINEONE** subcommand, you must remember to subtract one L-unit from the *y* offset value. This is necessary to prevent descenders on the last printed line from dropping off the bottom of the logical page.

The following examples illustrate two methods for positioning the first line of text:

1. The position of the first line of data defaults by specifying the **SETUNITS** command prior to the **PAGEDEF** command, like this:

   ```
   SETUNITS  1 IN 1 IN
             LINESP 8 LPI;
   FORMDEF   ABCD
             OFFSET 0 .5;
   PAGEDEF   ABCD
             WIDTH 7.5
             HEIGHT 10
             DIRECTION ACROSS;
     FONT GS12 GS12;
     PRINTLINE REPEAT 60
             FONT GS12
             POSITION  0 TOP;
   ```

   Note: It is important that the **LINESP** subcommand (of the **SETUNITS** command) must precede the **PAGEDEF** commands.

   If the **LINESP** subcommand *follows* the **PAGEDEF** command, PPFA then uses the default **LINESP** value to calculate the y offset value, which is used to position the first line of print.

The default for the **LINESP** subcommand of the **SETUNITS** command is 6 lpi. If **LINEONE** is allowed to default, based upon the **LINESP** default, the **LINEONE** value is 31 L-units:

LINEONE = ((240 L-units / 6 lpi) x 80%) − 1 L-unit= 31 L-units.

This valueis the vertical (*y*) position of the printline because **TOP** is specified in a later **POSITION** subcommand. However, this value may cause the data to exceed the bottom boundary of the logical page if the **LINESP** value is changed later.

2. Another way you can specify the starting position for the first print line is to specify **LINEONE** explicitly, like this:

```
FORMDEF   ABCD
          OFFSET 0 .5;
PAGEDEF   ABCD
          WIDTH 7.5
          HEIGHT 10
          LINEONE 0 PELS 23 PELS
          DIRECTION ACROSS;
SETUNITS  1 IN 1 IN
          LINESP 8 LPI;
  FONT GS12 GS12;
  PRINTLINE REPEAT 60
          FONT GS12
          POSITION  0 TOP;
```

In this example, the **LINESP** subcommand following the **PAGEDEF** command will not cause a data placement problem because the **LINEONE** command determines explicitly where the first line of text is positioned, and no default **LINESP** value is used:

LINEONE = [(240 L-units / 8 lpi) x 80%] − 1 L-unit= 23 L-units

If you use the **LINEONE** command to specify an absolute starting position for the first line, in L-units, you must remember to subtract one L-unit from that value.

Changing Logical Page Print Direction

Logical pages can have four different print directions: **ACROSS**, **DOWN**, **BACK**, and **UP**. This example shows that all four directions can be specified in relation to one offset specification:

```
FORMDEF ABCD
        OFFSET (1) (2) ;
PAGEDEF DEFG  ;
  PAGEFORMAT DEFG1
             WIDTH (3)
             HEIGHT (4)
             DIRECTION ACROSS ;
    PRINTLINE  ;
  PAGEFORMAT DEFG2
             WIDTH (3)
             HEIGHT (4)
             DIRECTION DOWN ;
    PRINTLINE  ;
  PAGEFORMAT DEFG3
             WIDTH (3)
             HEIGHT (4)
             DIRECTION BACK ;
    PRINTLINE  ;
  PAGEFORMAT DEFG4
```

```
          WIDTH (3)
          HEIGHT (4)
          DIRECTION UP ;
    PRINTLINE  ;
```

One page definition is used to simplify the example, yet four logical pages are specified. The **PAGEFORMAT** commands create subsets of page definitions for each logical page.

Note: The page formats in this example require an Invoke Data Map structured field at the place in the data file where you want to change page formats. The **PRINTLINE** commands are required but are not relevant in the example.

The **DIRECTION** subcommand with one of its four direction parameters (**ACROSS**, **DOWN**, **UP**, or **BACK**) specifies the print direction of the logical page.

Figure 20 shows the format of each of the logical pages specified in the page definition with the direction specification of each. The pages with the **ACROSS** and **BACK** directions are in portrait presentation. The pages with the **DOWN** and **UP** directions are in landscape presentation.

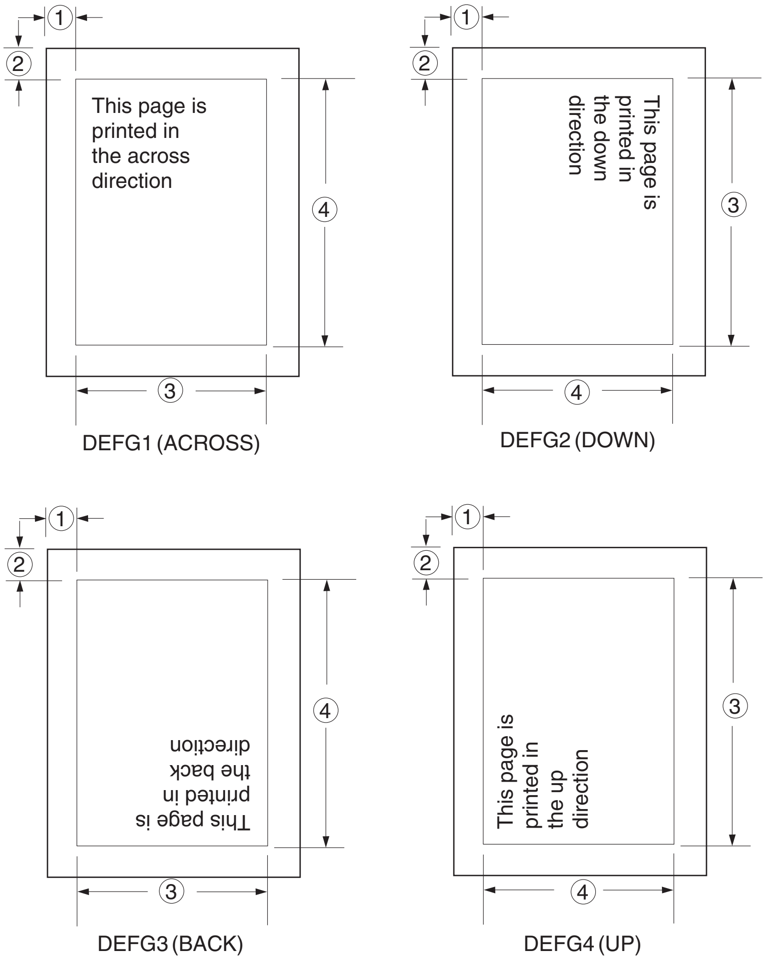


Figure 20. Logical Page Print Directions in Relation to Origin

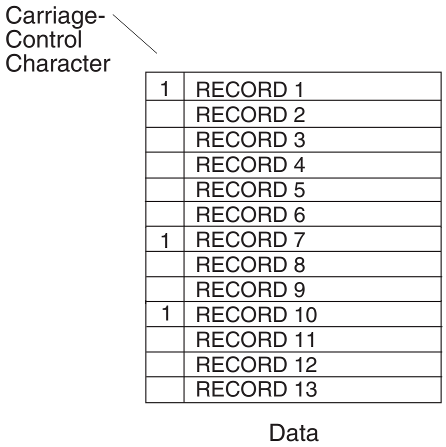
The media origins and logical page origins do not change with the presentation of the data on the page. The **OFFSET** subcommand of the form definition need not change. However, the width and height dimensions do change; that is, the **WIDTH** subcommand always governs the horizontal (inline) dimension as you view the page, and the **HEIGHT** subcommand always governs the vertical (baseline) dimension whether the page is in portrait or in landscape presentation. Ensure that these specifications do not cause the logical page to cross the edge of the physical page.

However, if the **DOWN** direction is specified for use with an InfoPrint Solutions Company continuous forms printer, the **PRESENT** and **DIRECTION** subcommands may need to be specified in the form definition. See “Specifying Page Presentation on Continuous-Forms Printers” on page 32 for more information.

Printing Line Data on a Print Server Printer

This example shows how you can print a data file developed for a line printer on a page printer without altering the data. The example compares the effects of line printer controls with the corresponding controls in the PPFA commands and subcommands. **PRINTLINE**, **LINESP**, **POSITION**, **CHANNEL**, and **REPEAT** are page definition controls related to the lines of text in your printout. Line printer controls examined are the forms control buffer (FCB) and carriage control characters.

As shown in Figure 21, a file consisting of 13 records is to be printed. Several different printouts of this data are formatted in the following examples. In the first two printouts, records 1–6 are printed on page 1, records 7–9 on page 2, and records 10–13 on page 3.



1	RECORD 1
	RECORD 2
	RECORD 3
	RECORD 4
	RECORD 5
	RECORD 6
1	RECORD 7
	RECORD 8
	RECORD 9
1	RECORD 10
	RECORD 11
	RECORD 12
	RECORD 13

Figure 21. Line-Data File

Figure 22 on page 42 shows the formatting process used when the file is printed on a line printer. For many line printers, an FCB is used to format the output in the S/370 (OS/390 & z/OS, VM, VSE) environment. The sample FCB represented in Figure 22 on page 42 determines that no printed page contain more than eight lines. A page can have exactly eight lines without using carriage control characters in the data. A page may contain any number of lines fewer than eight; this is effected by placing fewer than eight records between the carriage control characters in the data. In the data file in Figure 21, fewer than eight records are, in all cases, placed between channel 1 carriage control characters. A ninth record, if encountered before a carriage control character, would cause a page eject and a return to the beginning of the FCB. The printout shown in Figure 22 results from the data being formatted by this FCB.

FCB

Line No.	LPI	Channel
1	6	1
2	6	
3	6	
4	6	
5	6	
6	6	
7	6	
8	6	

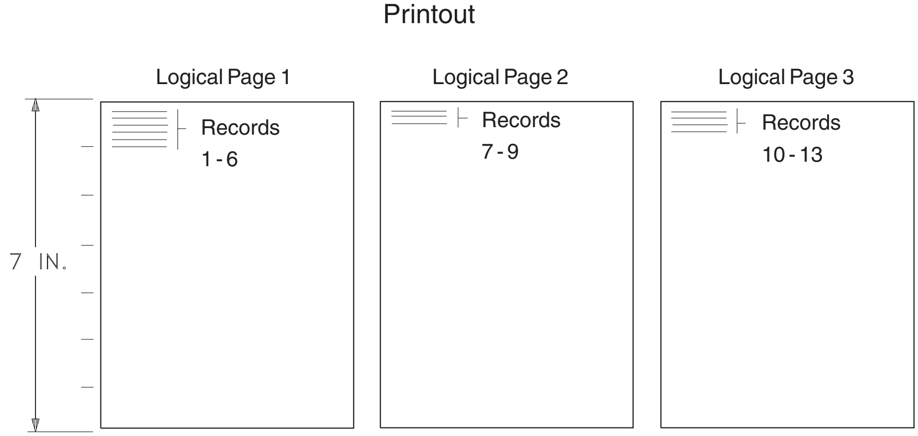


Figure 22. Data File Printed on a Line Printer

A page definition can work exactly the same way. Consider the following example:

```
SETUNITS 1 IN 1 IN
         LINESP 6 LPI  ;
PAGEDEF ABCD
        WIDTH 5
        HEIGHT 7
        LINEONE .5 .5  ;
  PRINTLINE CHANNEL 1
            POSITION MARGIN TOP
            REPEAT 8 ;
```

This command stream contains one new command (**PRINTLINE**) and four new subcommands (**LINESP**, **CHANNEL**, **POSITION**, and **REPEAT**) related to controlling individual lines.

- The subcommand has the same function as the LPI specifications in the FCB or in a Printer File; it defines the line density *i***LINESP***n* lines per inch.
- The **PRINTLINE** command contains the controls for one or more lines.
- The **CHANNEL** subcommand has the same function as the channel 1 control character in the FCB, causing a page eject at each channel 1 control character encountered in the data records.
- The **POSITION** subcommand establishes the location of the first line relative to the upper-left corner of the logical page. This example uses the **MARGIN** and

TOP parameters; however, numeric parameters similar to those used with the **OFFSET** subcommand can also be used. Those values are also relative to the logical page.

- The **REPEAT** subcommand is a commonly used control in PPFA text formatting. It is the way you specify the total number of **PRINTLINE**s in a logical page.

  Note: The constraints in specifying a **REPEAT** value and, thereby, the number of lines per page are: the lines-per-inch specification, the height of the logical page, and the font selection. The **REPEAT** variable "8" is chosen to equal the maximum number of records to be printed per page. As in the line printer version, if a ninth record were encountered before a channel 1 carriage control character, a page eject would occur and the line would be printed as the first line at the top of the next page.

The result of this page definition is represented in Figure 23.

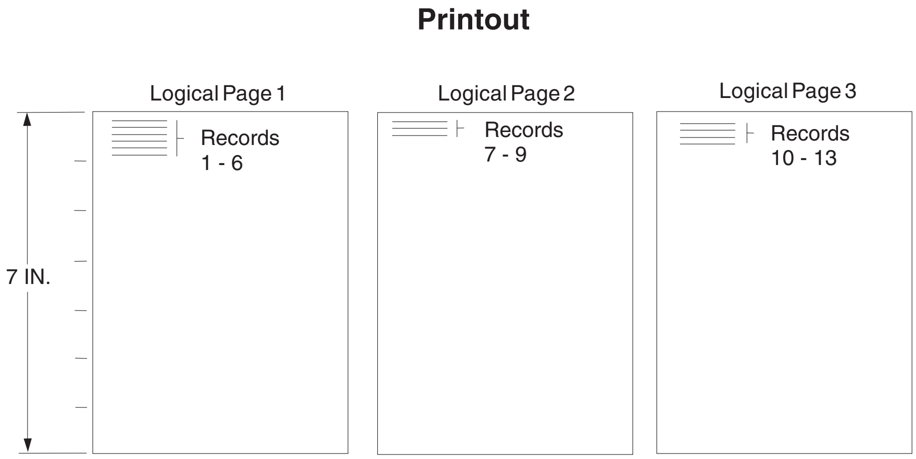


Figure 23. Printout Examples Specifying **POSITION MARGIN TOP**

Changing line printing specifications for the following example is shown in Figure 24.

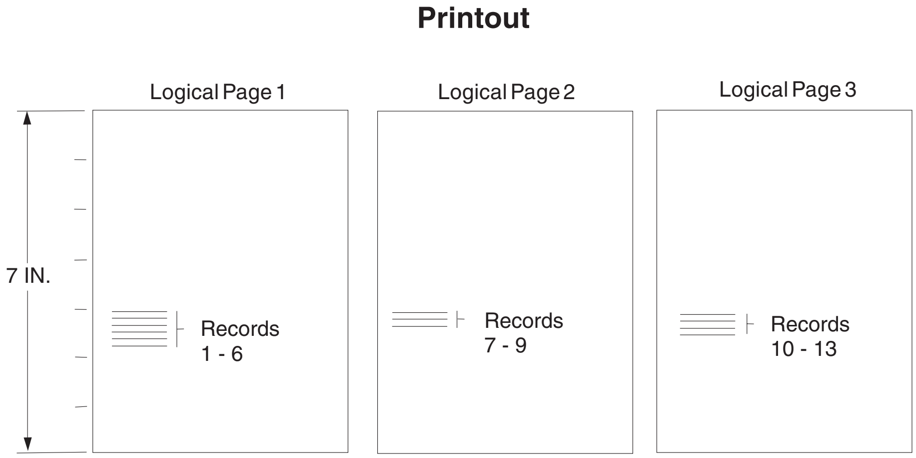


Figure 24. Printout Example Specifying **POSITION MARGIN 4.1**

```
SETUNITS 1 IN 1 IN
         LINESP 6 LPI ;
PAGEDEF ABCD
        WIDTH 5
        HEIGHT 7
        LINEONE .1 .1  ;
  PRINTLINE CHANNEL 1
            POSITION MARGIN 4.1
            REPEAT 8 ;
```

Observe that the second parameter of **POSITION** is no longer **TOP**; instead it is 4.1, which places the first line of text 4.1 inches down the page rather than at the top (Figure 24 on page 43).

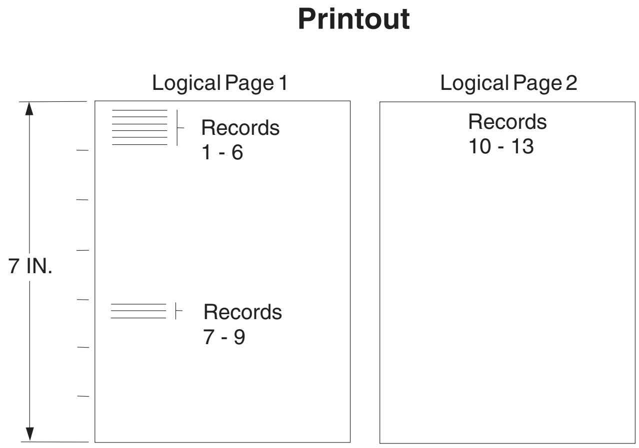


Figure 25. Printout Example Specifying **POSITION MARGIN TOP** *and* **POSITION MARGIN 4.1**

The following example and Figure 25 show a third version of the possible formats for the data represented in Figure 22 on page 42.

```
SETUNITS 1 IN 1 IN
         LINESP 6 LPI ;
PAGEDEF ABCD
        WIDTH 5
        HEIGHT 7
        LINEONE .1 .1 ;
  PRINTLINE CHANNEL 1
            POSITION MARGIN TOP
            REPEAT 8 ;
  PRINTLINE CHANNEL 1
            POSITION MARGIN 4.1
            REPEAT 8 ;
```

You also can skip over space using carriage control characters. This example shows how to do this by using a second **PRINTLINE** command to create a second starting position on the page (as shown in Figure 25). The second starting position is vertically 4.1 inches down from the top of the page; see the second **POSITION** subcommand. The two **CHANNEL 1** subcommands take turns mapping the records governed by the successive channel 1 carriage control characters in the data to their specified positions on the page. In this case, the carriage control 1 characters cause printing to alternate between the **TOP** position (0.1 inch down the page) and 4.1 inches down the page.

Processing Fields

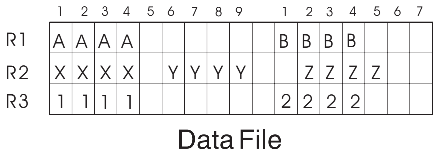
This section describes the mapping of individual fields to the printed sheets. The technique allows you to print unformatted data according to precise specifications, and these specifications can change without affecting the data file.

The rules for field processing of data files are:

- Each record in your file must correspond to a separate **PRINTLINE** command because each record is mapped separately. When processing identical fields, you can define a single printline and use the **REPEAT** subcommand.
- Each **FIELD** command must follow its associated **PRINTLINE** command, and more than one **FIELD** command can be specified for a single **PRINTLINE** command.

For this field-processing example, the data file shown in Figure 26 is used. Figure 27 on page 46 represents an output format that could be used to place data on a form, such as an invoice or an order. The page definition commands to print Figure 27 on page 46 are as follows:

```
PAGEDEF ABCD
        WIDTH 7 IN
        HEIGHT 8 IN ;
 PRINTLINE POSITION 1 IN 1 IN ; /*PROCESSING FOR R1              */
  FIELD START 1 LENGTH 4 ;      /*THE PRINTLINE POSITION IS      */
                                /*THE DEFAULT FOR THE FIRST FIELD*/
  FIELD START 11 LENGTH 4
        POSITION 4 IN 0 IN ;
 PRINTLINE POSITION 3 IN 4 IN ; /*PROCESSING FOR R2              */
  FIELD START 1 LENGTH 4 ;      /*DEFAULT POSITION               */
  FIELD START 6 LENGTH 4
        POSITION 0 IN 1 IN ;
  FIELD START 13  LENGTH 3
        POSITION 2 IN 3 IN ;
 PRINTLINE POSITION 1 IN 2 IN ; /*PROCESSING FOR R3              */
  FIELD START 1 LENGTH 4 ;      /*DEFAULT POSITION               */
  FIELD START 11 LENGTH 4
        POSITION 4 IN 0 IN ;
```



	1	2	3	4	5	6	7	8	9		1	2	3	4	5	6	7
R1	A	A	A	A							B	B	B	B			
R2	X	X	X	X		Y	Y	Y	Y			Z	Z	Z	Z		
R3	1	1	1	1							2	2	2	2			

Figure 26. Unformatted Print Data File

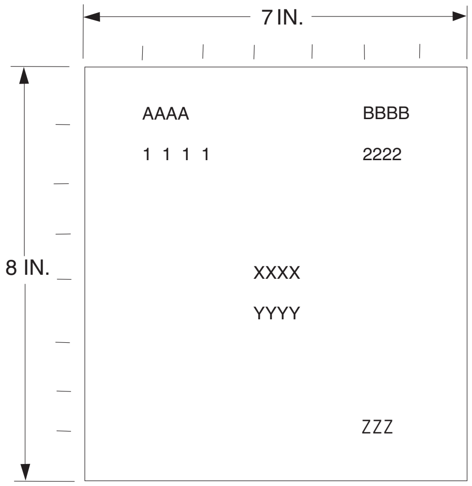


Figure 27. Data Arranged on the Printed Page

POSITION Subcommand as Used in this Example

The **POSITION** subcommand of each **PRINTLINE** command specifies the printline position relative to the logical page origin. The **POSITION** subcommands below **FIELD** commands specify a field position relative to the governing printline position. Following **POSITION** subcommands come the horizontal (*x*) then the vertical (*y*) offsets from the reference point. They are parallel in structure to the **OFFSET** subcommand of the form definition.

For example, the final **POSITION** subcommand places the final field 1 + 4 inches to the right of the left edge of the logical page, combining the *x* value of 1 in the **PRINTLINE** command, and the *x* value of 4 in the nested **FIELD** command. The 0 in the **FIELD** command specifies no change to the *y* value in the PRINTLINE command. Thus, the position of the final field is 5 IN (*x*), 2 IN (*y*).

Note: The first **FIELD** command within each **PRINTLINE** has no position specification, because the **PRINTLINE POSITION** value is the default for the first **FIELD** command nested under it.

Alternate controls for the *x* and *y* values of a **POSITION** subcommand are available. See the description of the **POSITION** subcommand in "FIELD Command" on page 354 and "PRINTLINE Command" on page 465.

FIELD Command as Used in this Example

In the **FIELD** command, the **START** and **LENGTH** parameters specify the location of the field in the record to be processed. **START** indicates the starting byte position, and **LENGTH** specifies the number of bytes in the field.

Because a field can be located independently within the data and on the printed page, more than one page definition or page format can be created for the same data file, each specifying different mapping of the data to the output pages.

Varying Fonts on a Page

This example illustrates a simple font variation within a printout. The task is to print a line-data file having the first line of each page in bold-faced type and the rest in standard type. This requires controls for two fonts in the page definition.

The commands to select a single font for the page, as shown in Figure 28, are as follows:

The **FONT** command contains two names: the local (STANDARD) name and the user-access (M101) name for the selected font.

```
PAGEDEF ABCD ;
  FONT STANDARD M101 ;
  PRINTLINE ;
```

Note: Fonts cannot be an FGID. Also, all page definitions require a **PRINTLINE** command.

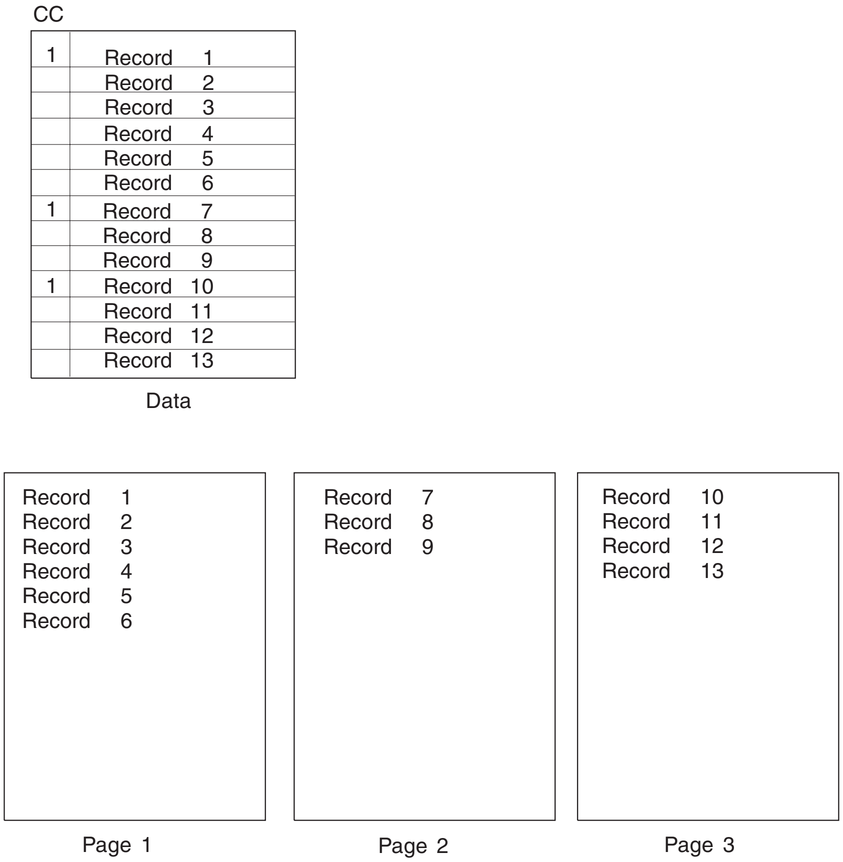


Figure 28. Data File Printed Using a Single Font

The next command stream changes the font by incorporating a **TRCREF** command. Assume the data file to be formatted incorporates table reference characters (TRCs) as shown in Figure 29 on page 48.

```
PAGEDEF ABCD ;
  FONT STANDARD M101 ;     /*CREATING LOCAL FONT NAMES  */
  FONT BOLDFACE M102 ;
  PAGEFORMAT ABCD ;
    TRCREF 0                /*DEFINING THE TRC VALUES    */
           FONT STANDARD ;
```

```
  TRCREF 1
         FONT BOLDFACE ;
PRINTLINE CHANNEL 1
          POSITION 1 IN 1 IN
          REPEAT 8 ;
```

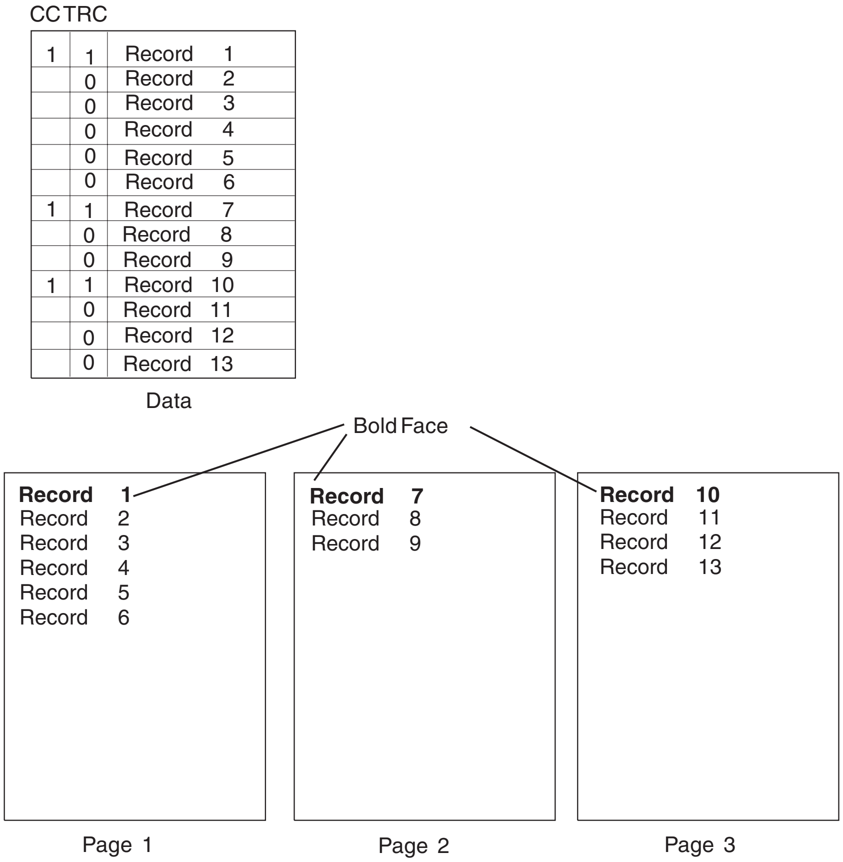


Figure 29. Font Change Using **TRCREF** *Command*

The TRCs in the data cause the font switch to be made. The **TRCREF** command equates a TRC in the data file with the local name of a font specified in the **FONT** command. The **FONT** command also contains the user-access name for the font. See Table 8 on page 219 for information on local names and user-access names. Because of the relationship among the user-access name, the local name, and the TRC number that is established in the page definition, the TRCs in the data can cause a font switch automatically.

You can specify fonts within a **PRINTLINE** command when the data file contains no TRCs. For example:

```
PAGEDEF ABCD ;
  FONT M101 ;
  FONT BOLDFACE M102 ;
    PRINTLINE CHANNEL 1              /*BOLDFACE LINE      */
              POSITION MARGIN  TOP
              FONT BOLDFACE ;
    PRINTLINE POSITION MARGIN NEXT   /*STANDARD-TYPE LINE */
              FONT M101
              REPEAT 7 ;
```

assume the data file represented in the sample print in Figure 30 is to be formatted by this page definition.

This command stream, based on a data file without TRCs, works on the principle that each line of output whose font you want to change from the font in the previous line must be controlled by a separate **PRINTLINE** command. The **FONT** subcommand of the **PRINTLINE** command names the font desired for that line. In this example, two **PRINTLINE** commands are used because one font change and two fonts are intended for the output. The user-access font names appear in the two **FONT** commands immediately below the **PAGEDEF** command and, optionally, a local name. M101 and M102 in the example are user-access names; **BOLDFACE** is a local name. Use the local name in the **FONT** subcommand of **PRINTLINE** if it is included in the corresponding **FONT** command, as is done for the first **PRINTLINE** command.

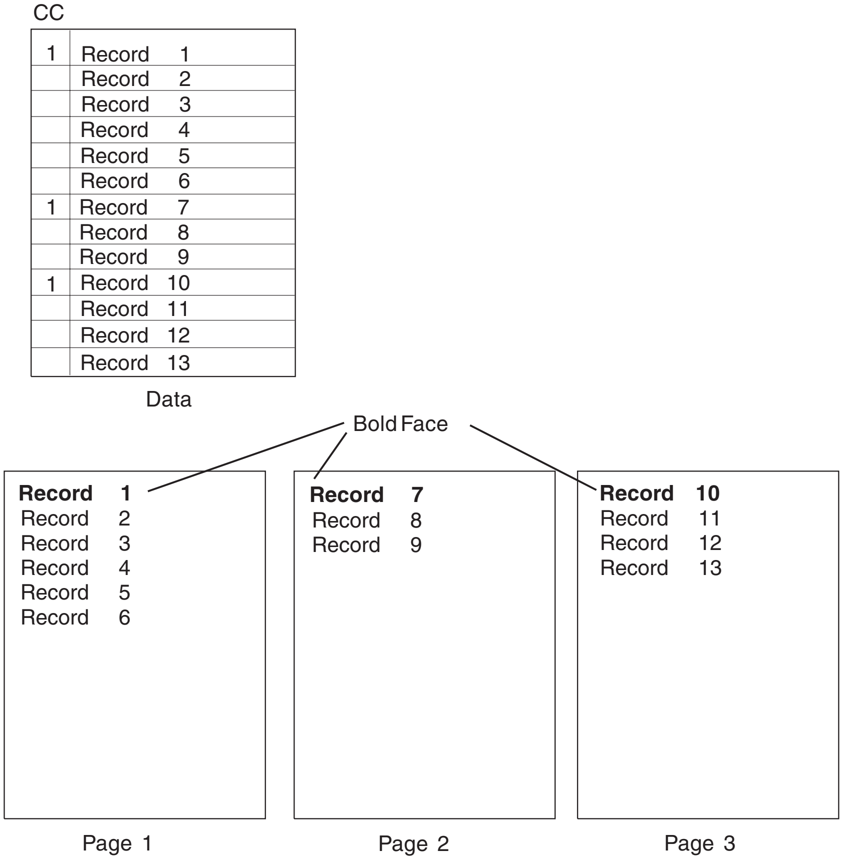


Figure 30. Font Change Using **FONT** *Commands and Subcommands*

Changing fonts field by field is similar to changing them in **PRINTLINE**s. You map each field individually with a **FIELD** command; include a **FONT** subcommand in the **FIELD** command. If a font change is desired for a field, as with the **FONT** subcommand of a **PRINTLINE** command, the font must be previously named in a **FONT** command.

Two possible defaults apply in case you do not specify a font within a field. If the governing **PRINTLINE** has a **FONT** subcommand, it contains the font default for the field. If the governing **PRINTLINE** has no font specification, the print server assigns a font according to its default rules.

Printing Lines in Two Directions on a Page

Lines can be printed in any of four directions, depending on the type of printer being used.

The four parameters for line direction are **ACROSS**, **DOWN**, **BACK**, and **UP**. The PPFA commands used to format a line-data file with lines printed in more than one direction (as shown in Figure 31) are stated in the following page definition:

```
PAGEDEF ATOG
        DIRECTION ACROSS ;
  PRINTLINE  POSITION 1 IN 1 IN       /*LINES A-E   */
             REPEAT 5 ;
  PRINTLINE  POSITION .5 IN 6 IN      /*LINE  F     */
             DIRECTION UP ;
  PRINTLINE  POSITION 1 IN 6 IN ;     /*LINE  G     */
```

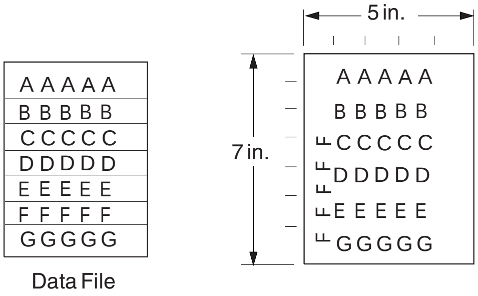


Figure 31. A Printout with More Than One Line Direction

In this page definition, the logical page direction **ACROSS** is specified. This is actually the default, but its inclusion clarifies that no direction control is needed for lines A–E. The default direction of a printline is the direction specification of the logical page of which it is part. The **PRINTLINE** command for the record F has a **DIRECTION** subcommand because the direction specification changes from that of the previous line. Record G is to be printed in the **ACROSS** direction again. A direction is not specified, however, because the **ACROSS** direction is the default for all lines in this page definition.

Note: If you are building the page definition for use with the 3800 printer, and if the input data contains table reference characters, you can use the **DIRECTION** subcommand of the **TRCREF** command to specify a font that prints **UP** on the page, as in line F. For more information, see "TRCREF Command (Traditional)" on page 490.

Printing Fields in Two Directions on the Same Page

This example is similar to Printing Lines in Two Directions on a Page, except that you learn how to control direction field by field. This method creates a field-processing page definition and places direction controls in the **FIELD** commands. This command stream contains a portion of the page definition controls, showing only the **PRINTLINE** commands:

```
PRINTLINE POSITION MARGIN TOP ;
  FIELD START 1 LENGTH 4 ;
PRINTLINE POSITION 2 IN 4 IN ;
  FIELD START 7 LENGTH 4
        DIRECTION UP ;
```

As expected in field processing, **FIELD** commands are nested within **PRINTLINE** commands. Figure 32 shows a simplified portion of an unformatted file and two pages of the printout formatted by the page definition, part of which is shown in the command stream. Two printlines are specified because, as Figure 32 shows, the data file contains two input record formats (1 and 3 are alike; 2 and 4 are alike) and because the fields are mapped to two different positions in the output. The assumption of this sample is that the data file is actually much longer than the portion shown. If, however, the records in the file alternate in format as the first four do, the two **PRINTLINE**s of this page definition formats as many records as are presented, two to a page, on pages 1 through *n*.

If more than two mappings are required by the print job, more than two **PRINTLINE** commands are required in the page definition.

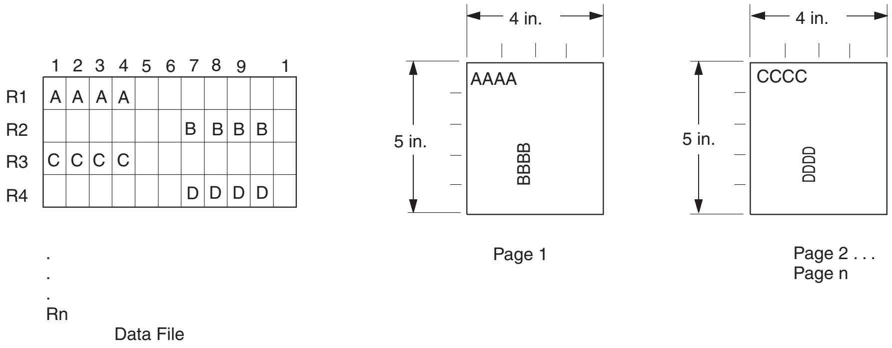


Figure 32. Field Direction

Rotating Fonts

Fonts rotate relative to the inline direction of lines (or fields).

This example focuses on a single letter A from FONTA. With PPFA, a single font specified in a page definition can produce letters in any of four rotations. This is accomplished by a **FONT** command that specifies rotation. If, as in this example, you want to vary the rotation of a font twice within a page, you use two **FONT** commands, one for each rotation. You also use two **PRINTLINE** commands to map the data to the printout, using the two rotations of the font. In a field processing application, **FIELD** commands can be used in the same way. These **PRINTLINE** commands name the rotated font in a **FONT** subcommand.

Figure 33 breaks down the elements required for the **FONT** commands and subcommands. Distinct local names and rotation specifications for each font are placed in a **FONT** command. These identify a font as rotated within a page definition. The rotation of a character is relative to the inline direction of a printline or field. The characters and rotations shown here assume an inline direction of **ACROSS**. See “PPFA Basic Terms” on page 8.

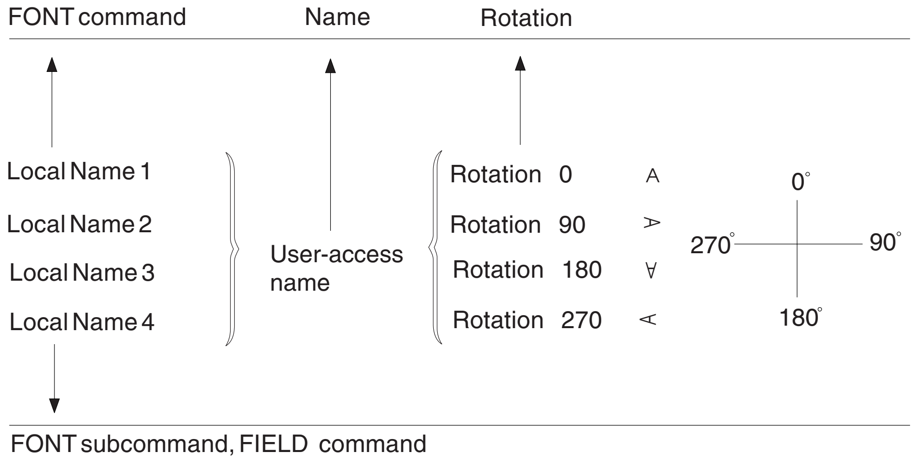


Figure 33. Character Rotation

You can use up to 16 possible combinations of logical page direction and font rotation for page printers other than the 3800.

The **FONT** subcommands within **PRINTLINE** or **FIELD** commands that name the rotated font in that page definition use only the local name. The following command stream shows the proper specification and nesting of **FONT** commands and subcommands for rotation.

```
PAGEDEF ABCD ;
  FONT FONTA M103 ;            /*NO ROTATION, LOCAL AND         */
                               /*USER-ACCESS NAMES.             */
  FONT FONTARTD180 M103        /*ROTATED FONT, LOCAL, USER-ACCESS*/
       ROTATION 180 ;          /*NAMES PLUS ROTATION SUBCOMMAND  */
                               /*AND PARAMETER.                 */
  PRINTLINE  FONT FONTA        /*LOCAL NAME                     */
             REPEAT 3 ;
  PRINTLINE  FONT FONTARTD180  /*LOCAL NAME                     */
             REPEAT 2 ;
```

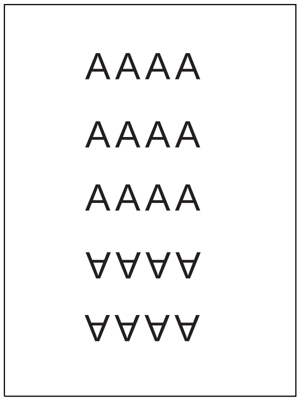


Figure 34. Example of Assumed Data File and Rotation Specifications

FONTA, identified in the first **FONT** command, requires no rotation parameter because it is printed in the default position (or 0° rotation) for font M103. For the rotated font, the second **FONT** command identifies FONTARTD180 (the local name) as M103 rotated 180°.

Using Traditional Kanji Formatting

Traditional kanji print presentation, called *tate*, is possible with printer, using a combination of font rotation and logical page direction. A logical page in the **DOWN** direction and a 270° font rotation provide the right combination to present kanji in tate format on the printer.

```
FORMDEF TATE
        OFFSET 1 IN 1 IN ;
PAGEDEF TATE
        HEIGHT 5 IN
        WIDTH 6 IN
        DIRECTION DOWN ;
  FONT  KANJIRTD  M104
        ROTATION 270 ;
  PRINTLINE FONT KANJIRTD
            REPEAT 3 ;
```

Figure 35 shows the result of formatting with the above page definition. The characters are added to lines down the page. Lines are added right to left.

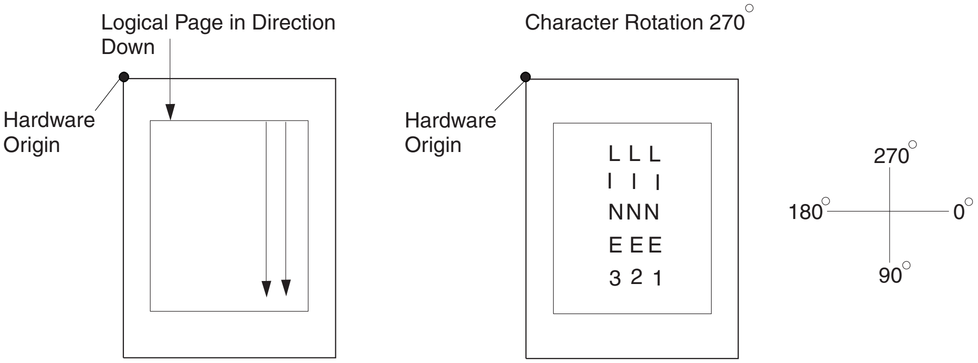


Figure 35. AFP Printer Tate Presentation

Printing Multiple-Up Pages

Multiple up is a printer's term for printing two or more pages of data on one side of a sheet, which is possible with your print server printers and PPFA formatting. The steps used in this example are:

1. Change the print direction of the logical page to one of the landscape presentations.
2. Conceptually divide the sheet of paper into parts, one for each multiple-up page (subpage).
3. Create a **PRINTLINE** position at the top of each multiple-up page.

This example assumes the existence of a line-data file with carriage control 1 characters after records 4, 7, and 11. Each carriage control 1 character begins a new page. Because there are really four pages on the sheet, a skip-to-channel 1 must be used four times. The fifth channel 1 character causes a page eject and the beginning of a new physical sheet. The PPFA commands that follow are for one version of a multiple-up page. This set of commands creates a page layout like the one shown in Figure 36 (the physical sheet is not shown).

```
FORMDEF MULTUP
        OFFSET 1 IN .5 IN ;
SETUNITS LINESP 4 LPI ;
PAGEDEF  MULTUP1
         WIDTH 10 IN
         HEIGHT 8 IN
         DIRECTION DOWN           /*FOR LANDSCAPE PRESENTATION  */
  PRINTLINE CHANNEL 1             /*PAGE 1                      */
            POSITION 1 IN 1.5 IN
            REPEAT 6 ;
            ENDSUBPAGE ;
  PRINTLINE CHANNEL 1             /*PAGE 2                      */
            POSITION 1 IN 5.5 IN
            REPEAT 6 ;
            ENDSUBPAGE ;
  PRINTLINE CHANNEL 1             /*PAGE 3                      */
            POSITION 6 IN 1.5 IN
            REPEAT 6 ;
            ENDSUBPAGE ;
  PRINTLINE CHANNEL 1             /*PAGE 4                      */
            POSITION  6 IN 5.5 IN
            REPEAT 6 ;
```

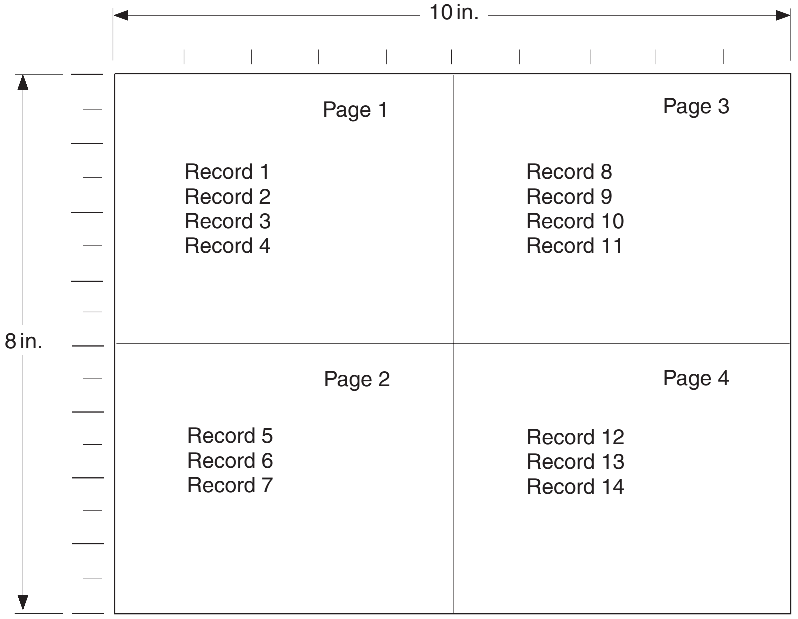


Figure 36. Multiple-Up Page Layout

The **DOWN PRINTLINE** direction creates a page with a landscape presentation typical of multiple-up printing. Individual **PRINTLINE**s are specified for the initial lines of the four pages. Ensure that the lines of each page fit in the space designated by the use of a small font.

Note: In this example, no font is specified for the page definition; therefore, the default font for the page printer is used. If you want a different font, write a **FONT** command naming it.

The next set of commands alters the sequence of pages.

```
FORMDEF MULTUP
  OFFSET 1 IN .5 IN ;
SETUNITS LINESP 4 LPI ;
PAGEDEF MULTUP2
        WIDTH 10 IN
        HEIGHT 8 IN
        DIRECTION DOWN ;
  PRINTLINE CHANNEL 1             /*  PAGE 1   */
            POSITION 1 IN 1.5 IN
            REPEAT 4 ;
            ENDSUBPAGE ;
  PRINTLINE CHANNEL 1             /*  PAGE 2   */
            POSITION 6 IN 1.5 IN
            REPEAT 4 ;
            ENDSUBPAGE ;
  PRINTLINE CHANNEL 1             /*  PAGE 3   */
            POSITION 1 IN 5.5 IN
            REPEAT 4 ;
            ENDSUBPAGE ;
  PRINTLINE CHANNEL 1             /*  PAGE 4   */
            POSITION  6 IN 5.5 IN
            REPEAT 4 ;
```

Here, the upper-right and lower-left pages have been reversed by reversing the position controls for the second and third printlines.

Figure 37 shows the changed printout resulting from the page definition command changes. Once you have set up your basic page definition, changes such as this become easy.

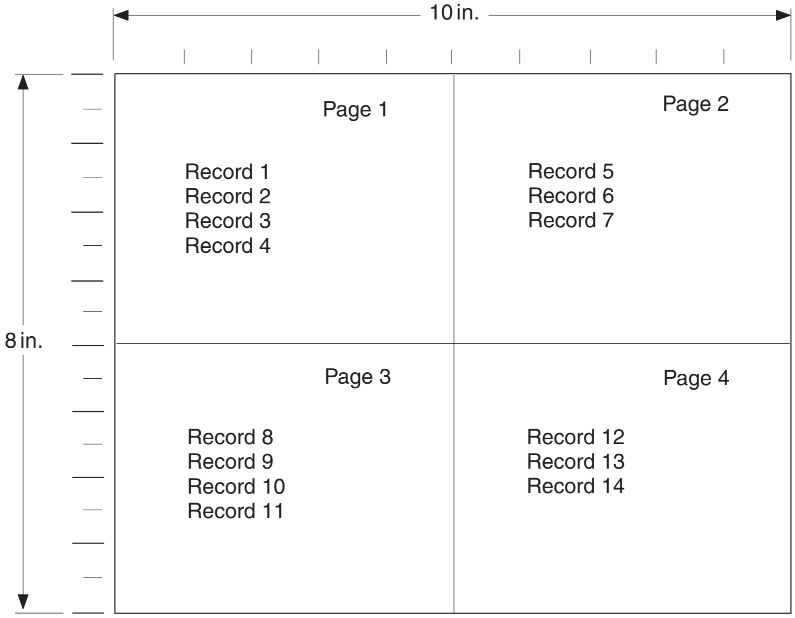


Figure 37. Multiple-Up Page Layout after Page Definition Modification

Note: The **ENDSUBPAGE** command can be used to mark the boundaries between subpages. Without it, the page definition is no different from any other sequence of **PRINTLINE**s with **POSITION** commands. Boundaries do not have to be marked unless conditional processing is being performed. The examples given here print identically with and without **ENDSUBPAGE** commands. (See "Subpage Description and Processing" on page 126 for more information.)

Chapter 4. Using Page Definition Commands for Record Format Line Data and XML Data

Record Formatting Function

The *record formatting function* allows an application to specify a format identifier (Record ID) with each set of output data fields (Data Record). The format identifier references a specific layout format in a page definition (**PAGEDEF**). At print time, each layout format (referenced by a Record ID in a Data Record) is retrieved from the **PAGEDEF** and used to position and format the associated Data Records/fields on the output page.

The purpose of the record formatting capabilities is to move more of the output formatting function into the **PAGEDEF** and allow for greater flexibility in creating and changing output pages without changing the base application. Rather than the application generating page headers, page trailers and group headers for each page (and thereby fixing the page endings), the page headers, page trailers and group headers can be generated by a **PAGEDEF** layout, allowing the page endings to change as font sizes or data layouts change.

In order to visualize how the record formatting function can be used, review the first six pages of "Record Formatting Examples" on page 81. These examples show the output of an application before and after it is formatted with **PAGEDEF** using the record formatting functions.

These functions are provided by several new PPFA commands (**LAYOUT**, **DEFINE COLOR**, **DRAWGRAPHIC**, and **ENDGRAPHIC**), and modifications to the **PAGEDEF**, **PAGEFORMAT**, **FONT**, **CONDITION**, and **FIELD** commands. This chapter provides an explanation of the record formatting functions with examples of their use. For details on the syntax of these commands, see Chapter 11, "Page Definition Command Reference," on page 301.

Some of the functions that can be accomplished in a layout format with the record formatting commands include:

- Selecting different formatting for different types of Data Records/fields based on the Record ID. The output formatting can change mid-page independent of where the output occurs on a page.
- Defining page headers and trailers to be automatically printed on subsequent pages. The headers and trailers can incorporate data from the associated Data Record.
- Numbering the output pages.
- Inserting page ejects can be automatic when text reaches the bottom margin.
- Creating group headings to be printed at the beginning of a group of data. For example, you can create group headings (including column headings) to be repeated each time a different account type is formatted on a banking statement. An active group heading is automatically repeated on subsequent pages until the data group ends.
- Forcing page ejects to occur in the output.
- Creating boxes with or without black and white or color shading. A set of boxes for a table can be started in a group header and automatically ended and restarted on subsequent pages until the table completes.

- Creating graphical objects such as circles, ellipses, lines, graphs, and so forth in color or black and white output.
- Formatting database records created with field delimiters (rather than fixed length fields).
- Aligning field output to the left or right.

Record Format Page Definition

A *record format page definition* specifies how you want data positioned on the logical page.

A record format page definition is a resource used by the print server that defines the rules of transforming line data and unformatted ASCII into composed pages and text controls for printing. With record format page definitions, you can perform the tasks listed in Table 4.

Table 4. Record Format Page Definition Tasks

Tasks	**Location of an Example**
Creating a page definition	"Page Definition Command Nesting" on page 61
Record ID	"Record ID Data Format" on page 61
Layout Command	"LAYOUT Command" on page 62
Body Records	"Body Records" on page 63
Fields	"FIELD Command" on page 64
Defining logical page size	"Defining Logical Page Size" on page 68
Positioning data on a logical page	"Positioning the Data" on page 70
Changing the print direction	"Changing Logical Page Print Direction" on page 70
Processing fields	"Processing Fields" on page 73
Printing in different directions	"Printing Lines in Two Directions on a Page" on page 76
Printing fields in two directions	"Printing Fields in Two Directions on the Same Page" on page 76
Changing fonts	"Varying Fonts on a Page" on page 77
Rotating fonts	"Rotating Fonts" on page 79
Printing kanji	"Using Traditional Kanji Formatting" on page 81
Example formats and commands	"Record Formatting Examples" on page 81

Page Formats within Page Definitions

Just as form definitions can include more than one copy group, page definitions can include several *page formats*. Page formats use basically the same subcommands as page definitions, and if a subcommand is specified in a page format, it overrides the value specified in the page definition for the page format. A single page definition may contain multiple page formats. If pages in a file are to be formatted differently, specify more than one page format in your page definition. Within a page definition, page formats are generated in the order in which they are specified.

Using more than one page format to control different pages requires one of the following:

- Adding the Invoke Data Map structured field to the data file each time you want to change page formats.
- Using conditional processing.

Refer to *Advanced Function Presentation: Programming Guide and Line Data Reference* for more information about the Invoke Data Map structured field.

Page Definition Command Nesting

The following simplified command stream shows the proper nesting of commands and the order in which they must be entered when you create a page definition:

```
[SETUNITS]
PAGEDEF
FONT
[OBJECT]
[DEFINE COLOR]
[PAGEFORMAT]
  [SEGMENT]
  [OVERLAY]
  [LAYOUT]
    [CONDITION]
    [FIELD]
    [DRAWGRAPHIC]
    [ENDGRAPHIC]
[PAGEFORMAT]
  [SEGMENT]
  [OVERLAY]
  [LAYOUT]
    [CONDITION]
    [FIELD]
    [DRAWGRAPHIC]
    [ENDGRAPHIC]
```

Notes:

1. Brackets enclosing a command mean the command is optional.
2. Indentations are used to improve readability.
3. Complete definitions of all commands are included in Chapter 11, “Page Definition Command Reference,” on page 301.

Command Nesting Rules

1. Record format **LAYOUT** commands and traditional **PRINTLINE** commands cannot be used within the same **PAGEDEF**. At least one **LAYOUT** command is required per page format for a record formatting page definition.
2. A **SETUNITS** command can be placed before any other PPFA command. The values set are in effect until the next **SETUNITS** command.
3. **SEGMENT** and **OVERLAY** commands must be specified under their associated **PAGEFORMAT** command.
4. The first **PAGEFORMAT** command can be omitted in a page definition, if the page definition contains only one page format. If the **PAGEFORMAT** command is omitted, the **PAGEDEF** command parameters are used to define the page format.
5. One file can contain multiple sets of page definitions.

Record ID Data Format

In order to allow different formats for different groups (or tables) of data, each of which have an unpredictable number of entries, a Record ID is assigned to each output record to identify the type of record and control layout formatting. An application can group data fields that are to be formatted together as an entity into Data Records with a specific Record ID. For example, in a bank statement, the data fields for a check transaction might be grouped together with a Record ID identifying that record as a check transaction. The **PAGEDEF** would then define a special layout format for a check transaction with a matching Record ID (see “Record Formatting Examples” on page 81 for detailed examples).

Record formatting in PPFA is achieved by identifying each input record in the data file with a 10 byte ID, similar to an expanded carriage control (CC) (see "Basic Controls in Record Format Line Data" on page 13 for additional information). Each record in the data file must contain a Record ID if record formatting is used. The Record ID must be the first 10 bytes in ***every*** print record in the data file.

Even though the Record ID is specified as a character string, the Record ID is treated as a hexadecimal string, not a character string. This means there is no translation from ASCII to EBCDIC or vice versa when the Record ID is processed. The Record ID in the input data must match exactly the string specified for the **LAYOUT** Record ID in the page definition in order for correct processing to occur.

When a record is read from the data file at print time, the print server uses the 10 byte Record ID to determine which **LAYOUT** command in the page definition should be used to format the record.

TRCs (Table Reference Characters) cannot be used with record format data. If you have TRCs in the data and tell the print server that TRCs are present at print time, the print server uses the TRC byte as the first byte of the Record ID, and the Record ID is not recognized as such.

Data files can contain both carriage controls and Record IDs. If your data file is mixed mode (line data plus MO:DCA structured fields), then you ***must*** have a CC byte in the data. The CC byte is not counted as part of the 10 byte Record ID. If your file is plain line data, then CCs are allowed but not required. (See "Basic Controls in Record Format Line Data" on page 13 for additional information.)

LAYOUT Command

When record formatting, the **LAYOUT** command is used instead of traditional **PRINTLINE** commands in the page definition. You cannot mix record format **LAYOUT** and traditional **PRINTLINE** commands in the page definition. With **LAYOUT** (see "LAYOUT Command (Record Format)" on page 400), you can identify four types of Data Records:

- Body Records
- Page Headers
- Page Trailers
- Group Headers

Each of the record types is discussed in the following sections. No matter which type of record you are formatting, you can control the positioning, font, color, and direction for the print record.

The **POSITION** keyword on the **LAYOUT** command is used to set the initial print position for subsequent text and graphics placed with the **FIELD** and **DRAWGRAPHIC** commands.

- The **horizontal position** can be specified as **LEFTMARGIN**, at the same position as the previous layout, or at an absolute or relative location given in inches, millimeters, centimeters, points, or pels (see "PAGEDEF Command" on page 444).
- The **vertical position** can be specified as **TOPMARGIN**, at the same position as the previous layout, at the next vertical position (using current **LINESP** value), or at an absolute or relative location given in inches, millimeters, centimeters, points, or pels (see "PAGEDEF Command" on page 444).

Body Records

The BODY layout type is used for the majority of data in the user's input file. That is, any record that is not used for special processing as a page header, page trailer, or group header, contains data to be formatted and placed on the page.

Body records are positioned initially with the **LAYOUT** command. The default *x* (horizontal) position for each body record is to be at the same horizontal position as the previous **LAYOUT**. If this is the first **LAYOUT** on a logical page, the default horizontal position is 0.

The default *y* (vertical) position is to place the layout record down one line (as defined in the **LINESP** subcommand of the last **SETUNITS** command) from the previous field. If this is the first **LAYOUT** on a logical page, the default vertical position is one line down from the top margin of the logical page. See "PAGEDEF Command" on page 444 for details about margins.

You can specify the rotation of data with the **DIRECTION** keyword on **LAYOUT**. All of the fields defined for this record layout uses the same direction unless it is overridden on the **FIELD** command. On relative **LAYOUT**s and their fields, the rotation must be **ACROSS**, so that they have the same net rotation as the page format.

You can also specify fonts and color to be used for the text formatted with this layout record. Double-byte fonts can additionally be requested if you have double byte characters in your data. The color of the text and graphic borders is specified with the **COLOR** keyword. See "DEFINE COLOR Command" on page 313 and "FONT Command" on page 394 for details.

Page segments, overlays and objects can be included with keywords on the **LAYOUT** command. This processing is the same as the traditional **PRINTLINE** command.

Body records can also be identified as belonging to a group. When the **GROUP** keyword is used on the body **LAYOUT**, the group header that is in effect at the time is repeated on subsequent pages as long as the input records use Record ID's that select body **LAYOUT** and use the **GROUP** keyword. The group is ended as soon as a Record ID in the input selects a **LAYOUT** that does not use the **GROUP** keyword.

Page Headers and Trailers

Page headers and trailers are printed automatically on each new page. Default headers and trailers can be created, which are automatically invoked on each new page without requiring or allowing any input data. No input record data is allowed in a default header or trailer because they are triggered automatically by page ejects and are not associated with any records in the input data file. See "LAYOUT Command (Record Format)" on page 400 for additional details.

Rather than using the defaults, you can create headers and trailers that are invoked by a Data Record containing the header or trailer Record ID. These headers and trailers can use input record data in their layout, however it is not required.

The following example creates a page header and trailer. See "PAGEDEF Command" on page 444 for additional details.

```
LAYOUT C'statmid'
  SEGMENT ibmlog  1.15 in 1.35 in
   PAGEHEADER NEWPAGE
   POSITION SAME ABSOLUTE NEXT;

LAYOUT C'pgenum' PAGETRAILER
   POSITION SAME ABSOLUTE 10.7 in;
```

Figure 38. Sample Page Header and Trailer

Group Headers

A Group Header layout consists of text, graphics, and other data that is to be printed at the beginning of a group of user records. For example, if you are creating a banking statement, you might define a Group Header for checking, one for savings, and so forth.

The group header is defined with a special **LAYOUT GRPHEADER** command, and stays in effect until a **BODY** layout is encountered that specifies **NOGROUP**. See "LAYOUT Command (Record Format)" on page 400 for additional details on the **GRPHEADER** subcommand.

If a logical page eject occurs before the group is ended, the header is printed after the top margin on each new page until the group ends.

FIELD Command

The **FIELD** command is used to identify a field in a Data Record to be formatted and placed on the page. **FIELD** must follow the **LAYOUT** command, and parameters that are not specified on **FIELD** are inherited from the previous **LAYOUT**. This section describes the new keywords on **FIELD** that are used with record formatting.

Page numbering can be accomplished by specifying **FIELD** with the **PAGENUM** parameter. Most often, you specify **FIELD PAGENUM** with other formatting information such as position and alignment, which causes the current page number to print at the specified position. The current page number is calculated based on the specification of the **PAGECOUNT** parameter on the previous **PAGEDEF** or **PAGEFORMAT** command. You can override the page number to a specific value using the **RESET** parameter on the **FIELD** command. For details, see "Page Numbering" on page 66.

You can retrieve the value of the Record ID for printing using the **RECID** keyword on **FIELD**. **RECID** also has **START** and **LENGTH** subparameters to allow only portions of the Record ID to be printed. Normally, you only use the **RECID** parameter for debugging your application by tracing which Record IDs are being processed, although it can be used for anything that makes sense for your application.

You can also specify the **POSITION**, **COLOR**, **DIRECTION**, and **ALIGN** keywords with the **PAGENUM** or **RECID** parameters on **FIELD**. The **BARCODE** and **SUPPRESSION** keywords are not allowed with **PAGENUM** or **RECID**, but can be used with other text fields from the Data Record.

ALIGN is a keyword that is allowed with the **START**/**LENGTH** or **TEXT** forms of the **FIELD** command, but only if you are doing record formatting. **ALIGN** lets you specify whether the field text should be **LEFT** or **RIGHT** aligned at the given horizontal position.

If your Data Records are stored in a database, the fields may be separated with "field delimiters" instead of just being positional within the record. The **DELIMITER** keyword on the preceding **LAYOUT** command is used to specify the one- or two-byte value that is used to separate fields in the Data Records.

If your data uses field delimiters, you can also specify the **FLDNUM** parameter on the **FIELD** command to indicate the number of the field within the record to be extracted, rather than the **START** position. Fields are numbered from left to right beginning with "1". You can also use the starting position (**START**) and **LENGTH** keywords with the **FLDNUM** to indicate that only part of the field is to be formatted. An example of a typical command is:

```
COMMANDS
 .
 .
 .
 LAYOUT 'abc' DELIMITER '*';
  FIELD  FLDNUM 1  START 2  LENGTH 8   ALIGN RIGHT
    POSITION  5.6 in  CURRENT
    FONT varb ; /* Variable text - Amount  */
  FIELD  FLDNUM 2  ALIGN LEFT
    POSITION  1.1 in  .9 in
    FONT varb ; /*variable - customer name */


DATA
 abc       *Here is some data*more data*

FIELDS used
 1st field  'ere is s'
 2nd field  'more data'
```

Figure 39. Sample Commands and Data With Delimiters.

Controlling Page Formatting

Parameters on the **PAGEDEF** and **PAGEFORMAT** commands let you specify the margins of the page. The **TOPMARGIN** and **BOTMARGIN** keywords are used to reserve space at the top and bottom of the page. The page headers and trailers are normally placed into this reserved space.

Note: No other text or objects should be written into the margins - only page header and trailer data.

The bottom margin is also used for two other purposes:

- a **BODY** or **GRPHEADER** Data Record that would cause the baseline position to move into the bottom margin area causes a logical page eject
- any graphic that has been started with the **DRAWGRAPHIC** command, but not explicitly ended, automatically ends at print time before it extends into the bottom margin area.

You can force a new logical page in the output with the **NEWPAGE** keyword on a **LAYOUT** command (see "LAYOUT Command (Record Format)" on page 400). When an input record is encountered whose Record ID matches that **LAYOUT** name, a page eject is completed before the record data is processed. If this is a header or trailer layout, the page eject is performed before the header or trailer becomes active.

The **ENDSPACE** keyword can also be used to control where page ejects are performed. If **ENDSPACE** is coded on a **LAYOUT**, and a Data Record with the matching Record ID is encountered, a page eject is performed before the data is processed - if the remaining space on the page (before the bottom margin) is less than the **ENDSPACE** value.

The **ENDSPACE** keyword can be used to ensure that a Table Heading (Group Heading) does not print at the end of a page without allowing space for additional Data Records (body records), or to ensure that a table entry does not print at the bottom of a page without allowing space for a totals record.

The following example shows the use of page margins and the **NEWPAGE** and **ENDSPACE** keywords:

```
PAGEFORMAT  chub1   TOPMARGIN 2 in BOTMARGIN  2 in;
/************************************************/
/** statmid  BODY                              **/
/************************************************/
LAYOUT  C'statmid'  PAGEHEADER NEWPAGE  ENDSPACE  .5 in
              POSITION .6 in ABSOLUTE .55 in;
       FIELD  TEXT C'Big Brother Bank'  ALIGN LEFT
              FONT comp ;   /* default to LAYOUT positioning*/
```

Figure 40. Sample Page Formatting

Page Numbering

Page numbers can be placed with the **PAGENUM** keywords on the **FIELD** command. **PAGENUM** lets you specify whether the page number should print or not, and whether you want it reset to a specific value rather than using the current value (page count).

The page number prints as an integer (for example, 1, 2, 3, ...) and has a valid range of 1 to four billion (four unsigned bytes of data). If the specified or defaulted font used for printing the page number is other than an EBCDIC font, you must specify it using the **TYPE** subcommand on the **FONT** command.

The page number prints using the font specified on the **FIELD** command. You can also select a **POSITION**, **COLOR**, and **DIRECTION** for the page number using existing **FIELD** keywords.

The **ALIGN** parameter on **FIELD** can also be used to specify whether you want the page number **LEFT** or **RIGHT** aligned at the given position.

The **PAGECOUNT** keyword is allowed with the **PAGEDEF** and **PAGEFORMAT** commands that allows you to specify how page numbering is to be handled when switching between page formats. Page numbering can be stopped, reset, resumed for a certain point or continued from a certain point. For a detailed description on how to specify these options, see “PAGEDEF Command” on page 444.

Graphical Objects

When creating output with record formatting, you can use the **DRAWGRAPHIC** commands to create boxes, lines, circles, and ellipses relative to the data printed with the **LAYOUT** command. **DRAWGRAPHIC** can be used with **DEFINE COLOR** to shade an object with a percentage of black or other colors, however **DRAWGRAPHIC** is not allowed if you are formatting with the traditional **PRINTLINE**.

Conditional Processing Considerations

Conditional processing works much the same in record formatting as when using the traditional **PRINTLINE** processing. The only difference is the ability to process based upon a field that is defined by delimiters instead of just a fixed start position and length.

Logical Page Eject Processing

A logical page eject can be caused by the following:

- Any Record ID that references a layout format with a specification of New Page.
- A relative baseline overflow (a Body or Group Header layout format that when processed against the current input record causes an overflow of the current print position into the bottom margin). If processing of the input record would cause a relative baseline overflow, the page eject is processed before any part of the input record is printed.
- A Data Map change or Medium Map change, or, in Mixed-Mode, a Begin Document or Begin Page structured field.

Page Header, Page Trailer, and Group Header Data Records used with page ejects are activated in the following manner:

- If a Data Record specifies the Record ID of a **PAGEDEF** Page Header layout format, that Data Record is not printed on receipt but is saved as the active page header record (for that **PAGEFORMAT**). It is saved for the duration of the job or until a subsequent Data Record specifies a Page Header (for that **PAGEFORMAT**).
- If a Data Record specifies the Record ID of a **PAGEDEF** Page Trailer layout format, that Data Record is not printed on receipt but is saved as the active page trailer record (for that **PAGEFORMAT**). It is saved for the duration of the job or until a subsequent Data Record specifies a Page Trailer (for that **PAGEFORMAT**).
- If a Data Record specifies the Record ID of a **PAGEDEF** Group Header layout format, that Data Record is not printed on receipt but is saved as the active group header record. The **PAGEDEF** Group Header is printed when the next Data Record specifies a Body layout with a **GROUP** specification and on subsequent page ejects. The Group Header and its associated Data Record is kept active until a subsequent Data Record specifies a Body layout with a **NOGROUP** specification.

When a logical page eject occurs, the following actions are taken in the following order.

- For the current page:
  1. If this is the start of a line data document (no previous page ejects, group header records or body records have been processed with this **PAGEDEF**), current page items 1 through 3 are skipped.
  2. If an active page header record was in effect prior to this layout format, that record is presented on the current page using the matching layout. Otherwise, if the active **PAGEFORMAT** contains a default Page Header layout, that layout is used to present a page header.

3. If an active page trailer record was in effect prior to this layout format, that record is presented on the current page using the matching layout. Otherwise, if the active **PAGEFORMAT** contains a default Page Trailer layout, that layout is used to present a page trailer.

- For the new page:
  1. The current print position is moved to the top of the new page and offset from the top of the new page by the top margin. If the **PAGEFORMAT** is changed, the new Data Map's Margin Definition and layouts are used.
  2. If an active group header record exists for this **PAGEFORMAT**, that record is presented on the new page using the matching Record layout. Note that the group header is not actually printed and causes no action until a Body layout with Group Indicator is processed for the page. If the layout specifies relative positioning, the baseline position of the layout is offset from the top of the page by the top margin plus one line.
  3. If the page eject was caused by a Body layout, the input record causing the page eject is presented on the new page using the layout referenced by the record. If the layout specifies relative positioning and is preceded on the page by a group header, the baseline position is relative to the last printed line of the group header. If the layout specifies relative positioning and is not preceded on the page by a group header, the baseline position of the layout is offset from the top of the page by the top margin plus one line.

Note: The actual locations of 'top of page' and 'top margin' are affected by the text orientation. See "Using Margins in Record Formatting" on page 71 for additional information.

Defining Color Models

Record formatting provides you with the ability to predefine a color with your own name and then use that name anytime this color is needed. It works in much the same way as a **FONT** command where you define the **FONT** with an internal name and then use that name when you place text on the page.

Defining Logical Page Size

"Positioning a Logical Page on a Sheet" on page 23 shows how to establish the origin point of a logical page, relative to the media origin on a sheet of paper, using the **OFFSET** subcommand. The following example shows you how to establish the width and height of the logical page relative to this origin point. This example illustrates how the dimensions of a logical page are determined by form definitions and page definitions.

```
SETUNITS  1 IN 1 IN
          LINESP 8 LPI;
FORMDEF   ABCD
          OFFSET 0 .5;
PAGEDEF   ABCD
          WIDTH 7.5
          HEIGHT 10
          DIRECTION ACROSS;
  FONT GS12 GS12;
  LAYOUT 'abc'
          FONT GS12
          POSITION  0 TOP;
```

Normally, all parameters consist of a number and a unit of measurement, for example, 6 IN. (See "Units of Measurement" on page 220 for information on units that are available.) Numbers can be specified with up to three decimal places. The

LAYOUT command is included because at least one is required for all page definitions; see "LAYOUT Command (Record Format)" on page 400 for more information.

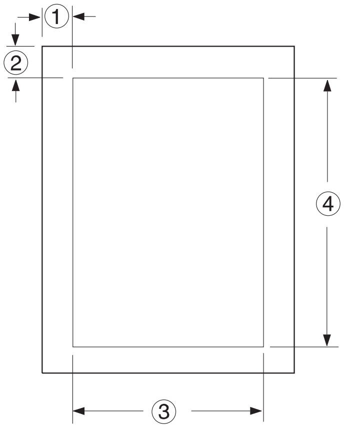


Figure 41. Logical Page Dimensions

The **OFFSET** subcommand (0) (.5) in the sample form definition establishes the corner or origin of the logical page relative to the physical sheet. The **WIDTH** and **HEIGHT** subcommands, (7.5) and (10), specify the dimensions of the logical page relative to the logical page origin.

Note: Be careful not to define a logical page larger than the physical sheet. PPFA does not check the size of the physical sheet.

Positioning the Data

The previous section showed you how to define the size of a logical page. The next examples show you how to position data inside the logical page.

Changing Logical Page Print Direction

Logical pages can have four different print directions: **ACROSS**, **DOWN**, **BACK**, and **UP**. This example shows that all four directions can be specified in relation to one offset specification:

```
FORMDEF ABCD
        OFFSET (1) (2) ;
PAGEDEF DEFG  ;
FONT GS12 GS12;
  PAGEFORMAT DEFG1
             WIDTH (3)
             HEIGHT (4)
             DIRECTION ACROSS ;
    LAYOUT 'abc'  ;
  PAGEFORMAT DEFG2
             WIDTH (3)
             HEIGHT (4)
             DIRECTION DOWN ;
    LAYOUT 'def'  ;
  PAGEFORMAT DEFG3
             WIDTH (3)
             HEIGHT (4)
             DIRECTION BACK ;
    LAYOUT 'ghi'  ;
  PAGEFORMAT DEFG4
             WIDTH (3)
             HEIGHT (4)
             DIRECTION UP ;
    LAYOUT 'jki'  ;
```

Note: The parenthetical numbers represent dimensions. Figure 41 on page 69 shows how these dimensions relate to the logical page.

One page definition is used to simplify the example, yet four logical pages are specified. The **PAGEFORMAT** commands create subsets of page definitions for each logical page.

Note: The page formats in this example require an Invoke Data Map structured field at the place in the data file where you want to change page formats. The **LAYOUT** commands are required but are not relevant in the example.

The **DIRECTION** subcommand with one of its four direction parameters **ACROSS**, **DOWN**, **UP**, or **BACK** specifies the print direction of the logical page.

Figure 42 on page 71 shows the format of each of the logical pages specified in the page definition with the direction specification of each. The pages with the **ACROSS** and **BACK** directions are in portrait presentation. The pages with the **DOWN** and **UP** directions are in landscape presentation.

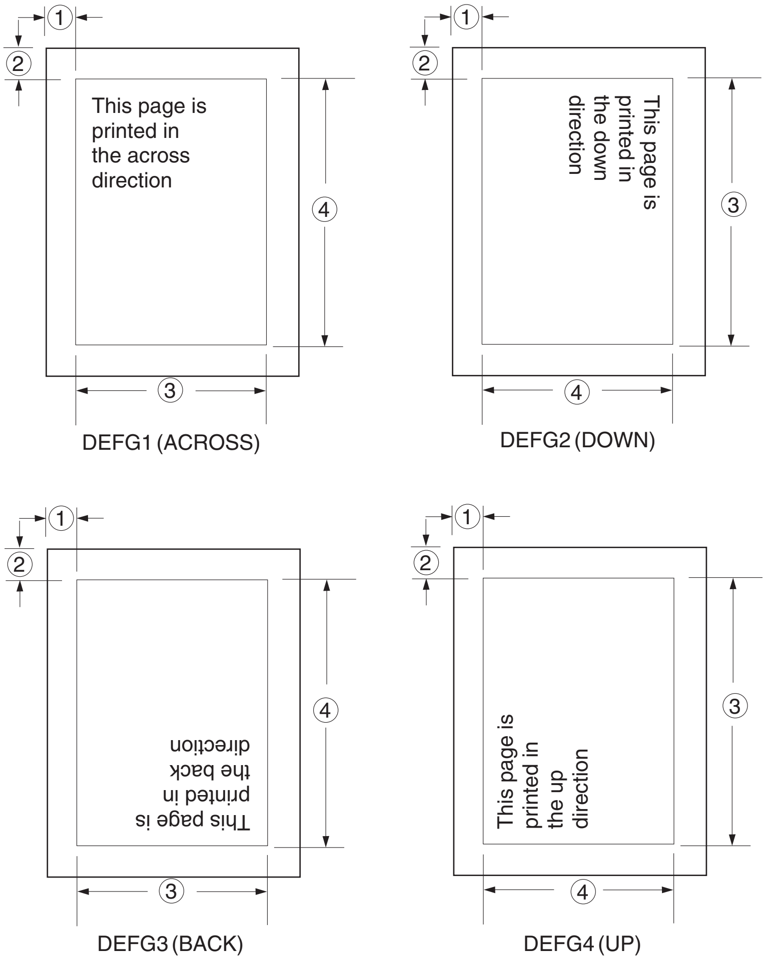


Figure 42. Logical Page Print Directions in Relation to Origin

The media origins and logical page origins do not change with the presentation of the data on the page. The **OFFSET** subcommand of the form definition need not change. However, the width and height dimensions do change; that is, the **WIDTH** subcommand always governs the horizontal (inline) dimension as you view the page, and the **HEIGHT** subcommand always governs the vertical (baseline) dimension whether the page is in portrait or in landscape presentation. Ensure that these specifications do not cause the logical page to cross the edge of the physical page.

However, if the **DOWN** direction is specified for use with an InfoPrint Solutions Company continuous forms printer, the **PRESENT** and **DIRECTION** subcommands may need to be specified in the form definition. See “Specifying Page Presentation on Continuous-Forms Printers” on page 32 for more information.

Using Margins in Record Formatting

Margins follow the inline direction of the page. For example, if the text orientation is **ACROSS**, the top-left diagram in Figure 43 on page 73 shows the left, top, right, and bottom margins, respectively. Once specified, these margins define a bounding box for the **PAGEFORMAT** as indicated by the dotted lines.

Note that if the text orientation is changed, the same bounding box applies to the new orientation, but the name of the margins change in the new orientation. For example, if the new text orientation is **DOWN**, as shown in the top-right diagram of this same figure, the top margin in the new orientation is now defined on the long side of the page, and so on.

Left Margin	Specifies the offset of the left margin along the i axis from the left edge of the page. The left edge of the page is the zero position on the i axis.
Top Margin	Specifies the offset of the top margin along the b axis from the top edge of the page. The top edge of the page is the zero position on the b axis.
Right Margin	Specifies the offset of the right margin along the i axis from the right edge of the page.
Bottom Margin	Specifies the offset of the bottom margin along the b axis from the bottom edge of the page.

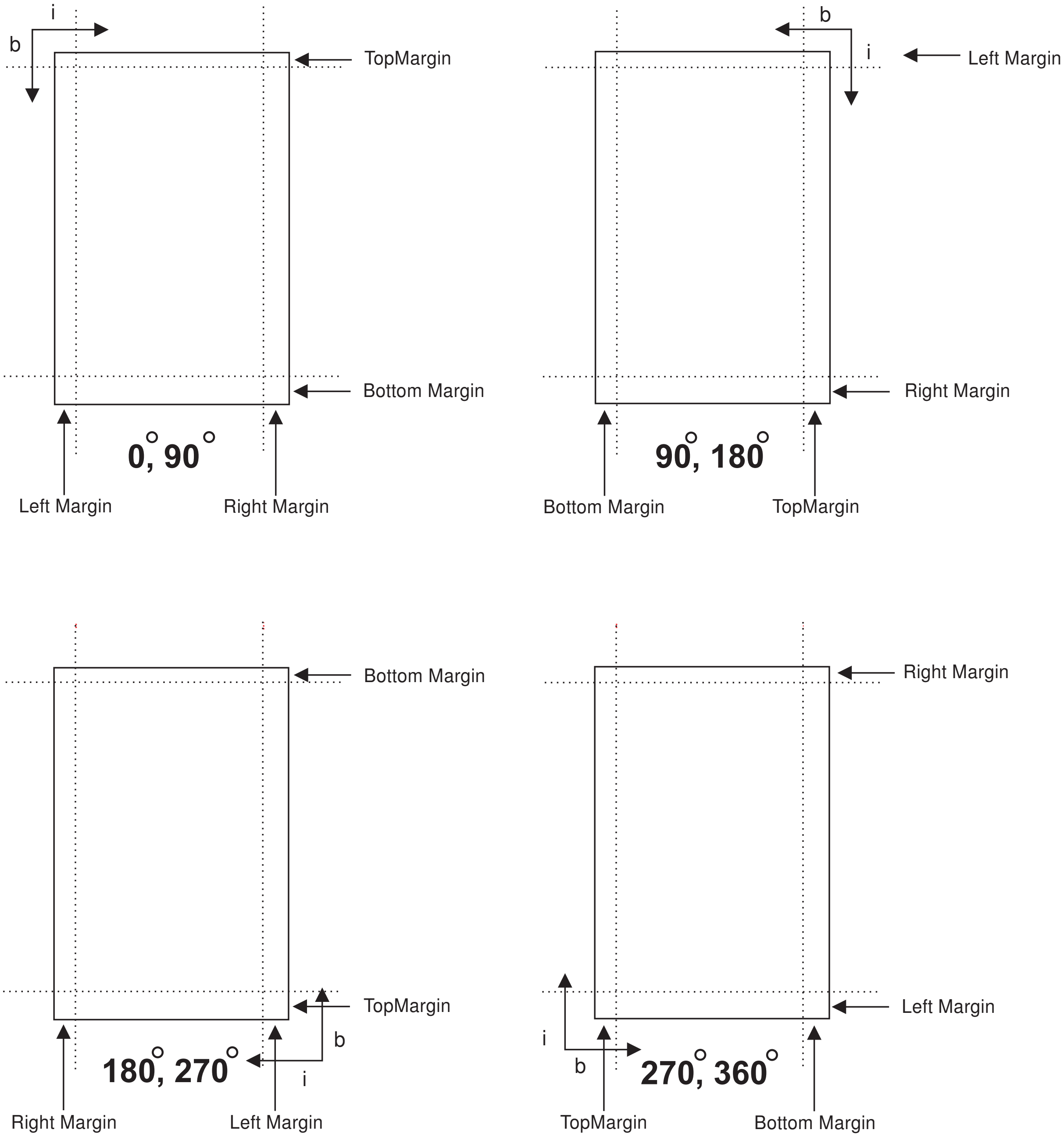


Figure 43. Relationship of Margin Definition to Text Orientation

Processing Fields

This section describes the mapping of individual fields to the printed sheets. The technique allows you to print unformatted data according to precise specifications, and these specifications can change without affecting the data file.

The rule for field processing of data files is: Each **FIELD** command must follow its associated **LAYOUT** command, and more than one **FIELD** command can be specified for a single **LAYOUT** command.

For this field-processing example, the data file shown in Figure 44 is used. Figure 45 represents an output format that could be used to place data on a form, such as an invoice or an order. The page definition commands to print Figure 45 are as follows:

```
PAGEDEF ABCD
        WIDTH 7 IN
        HEIGHT 8 IN ;
FONT GS12 GS12;
LAYOUT 'abc' POSITION 1 IN ABSOLUTE 1 IN ; /*PROCESSING FOR R1   */
  FIELD START 1 LENGTH 4 ;      /*THE LAYOUT POSITION IS        */
                                /*THE DEFAULT FOR THE FIRST FIELD*/
  FIELD START 11 LENGTH 4
        POSITION 4 IN 0 IN ;
 LAYOUT 'def' POSITION 3 IN ABSOLUTE 4 IN ; /*PROCESSING FOR R2  */
  FIELD START 1 LENGTH 4 ;      /*DEFAULT POSITION              */
  FIELD START 6 LENGTH 4
        POSITION 0 IN 1 IN ;
  FIELD START 13  LENGTH 3
        POSITION 2 IN 3 IN ;
 LAYOUT 'ghi' POSITION 1 IN ABSOLUTE 2 IN ; /*PROCESSING FOR R3  */
  FIELD START 1 LENGTH 4 ;      /*DEFAULT POSITION              */
  FIELD START 11 LENGTH 4
        POSITION 4 IN 0 IN ;
```

Note: The data area of this example does not show the Record ID.

	1	2	3	4	5	6	7	8	9		1	2	3	4	5	6	7
R1	A	A	A	A							B	B	B	B			
R2	X	X	X	X		Y	Y	Y	Y			Z	Z	Z	Z		
R3	1	1	1	1							2	2	2	2			

Data File

Figure 44. Unformatted Print Data File

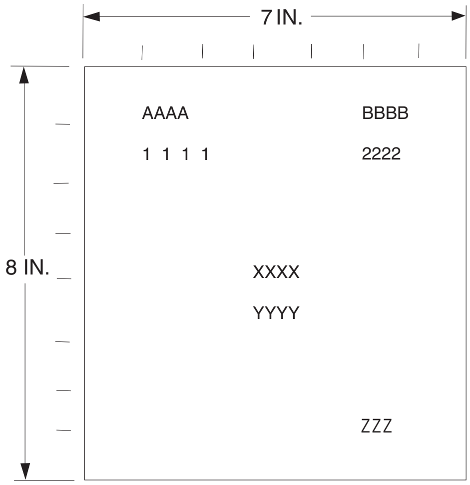


Figure 45. Data Arranged on the Printed Page

Position Subcommand

The **POSITION** subcommand of each **LAYOUT** command specifies the layout position relative to either the logical page origin or the previous **LAYOUT** position. The **POSITION** subcommands below **FIELD** commands specify a field position relative to the governing **LAYOUT** position.

This is for use in positioning text, objects and graphics. If **RELATIVE** is specified or **POSITION** is not specified, the baseline of the Position is relative to the previous **LAYOUT** position.

1. For **PAGEHEADER LAYOUT** the baseline position can be anywhere on a logical page.
2. For **PAGETRAILER**, **GROUPHEADER**, and **BODY LAYOUT** the baseline position can be anywhere on a logical page and can be specified as **RELATIVE**.

Following **POSITION** subcommands come the horizontal (*x*) then the vertical (*y*) offsets from the reference point.

x Specifies the horizontal offset from the left side of the logical page.

y Specifies the vertical offset from the top side of the logical page.

They are parallel in structure to the **OFFSET** subcommand of the form definition.

For example, the final **POSITION** subcommand on the previous example places the final field 1 + 4 inches to the right of the left edge of the logical page, combining the *x* value of 1 in the **LAYOUT** command, and the *x* value of 4 in the nested **FIELD** command. The 0 in the **FIELD** command specifies no change to the *y* value in the **LAYOUT** command. Thus, the position of the final field is 5 IN (*x*), 2 IN (*y*).

Note: The first **FIELD** command within each **LAYOUT** has no position specification, because the **LAYOUT POSITION** value is the default for the first **FIELD** command nested under it.

Alternate controls for the *x* and *y* values of a **POSITION** subcommand are available. See the description of the **POSITION** subcommand in **FIELD** command (Record Format).

FIELD Command as Used in this Example

In the **FIELD** command, the **START** and **LENGTH** parameters specify the location of the field in the record to be processed. **START** indicates the starting byte position, and **LENGTH** specifies the number of bytes in the field.

```
setunits linesp 6 lpi;
PAGEDEF rel9  replace yes
  direction across width 8.5 in height 11.0 in;
FONT GS12 GS12;
LAYOUT 'abc' position 0 IN 1.0 IN;

/* The fields will be placed at +120 pels, +24 pels (next) */
/* and +48 pels (.20 IN) from lines previously placed on page */

setunits linesp 10 lpi;
LAYOUT 'def' position 0 relative next;
  FIELD START 1 LENGTH 3 position 0 IN .5 IN;
  FIELD START 4 LENGTH 3 position 0 IN next;
  FIELD START 7 LENGTH 3 position current .20 IN;
```

Printing Lines in Two Directions on a Page

Lines can be printed in any of four directions, depending on the type of printer being used. Refer to your printer's documentation for the print directions supported by your printer.

The four parameters for line direction are **ACROSS**, **DOWN**, **BACK**, and **UP**. The PPFA commands used to format a line-data file with lines printed in more than one direction (as shown in Figure 46) are stated in the following page definition:

```
PAGEDEF ATOG
        DIRECTION ACROSS ;
  FONT GS12 GS12;
  LAYOUT 'abc'  POSITION 1 IN  ABSOLUTE 1 IN ; /*LINES A-E   */
  LAYOUT 'def'  POSITION .5 IN ABSOLUTE 6 IN   /*LINE  F     */
          DIRECTION UP ;
  LAYOUT 'ghi'  POSITION 1 IN ABSOLUTE  6 IN ; /*LINE  G     */
```

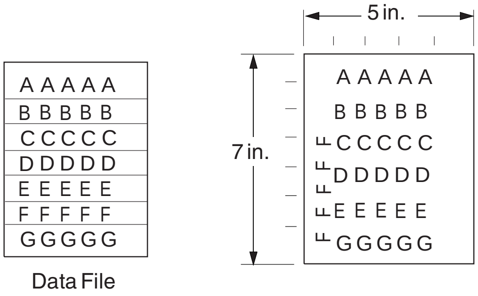


Figure 46. A Printout with More Than One Line Direction

Note: The data area of this example does not show the Record ID.

In this page definition, the logical page direction **ACROSS** is specified. This is actually the default, but its inclusion clarifies that no direction control is needed for lines A-E. The default direction of a layout is the direction specification of the logical page of which it is part. The **LAYOUT** command for the record F has a **DIRECTION** subcommand because the direction specification changes from that of the previous line. Record G is to be printed in the **ACROSS** direction again. A direction is not specified, however, because the **ACROSS** direction is the default for all lines in this page definition.

Printing Fields in Two Directions on the Same Page

This example is similar to Printing Lines in Two Directions on a Page, except that you learn how to control direction field by field. This method creates a field-processing page definition and places direction controls in the **FIELD** commands. This command stream contains a portion of the page definition controls, showing only the **LAYOUT** commands:

```
LAYOUT 'abc' POSITION LEFTMARGIN TOPMARGIN NEWPAGE;
  FIELD START 1 LENGTH 4 ;
LAYOUT 'def' POSITION 2 IN ABSOLUTE 4 IN ;
  FIELD START 7 LENGTH 4
        DIRECTION UP ;
```

As expected in field processing, **FIELD** commands are nested within **LAYOUT** commands. Figure 47 on page 77 shows a simplified portion of an unformatted file and two pages of the printout formatted by the page definition, part of which is shown in the command stream. Two layouts are specified because the data file contains two input record formats (1 and 3 are alike; 2 and 4 are alike) and because the fields are mapped to two different positions in the output. The assumption of this sample is that the data file is actually much longer than the portion shown. If, however, the records in the file alternate in format as the first four do, the two **LAYOUT**s of this page definition format as many records as are presented, two to a page, on pages 1 through *n*.

If more than two mappings are required by the print job, more than two **LAYOUT** commands are required in the page definition.

Note: The data area of this example does not show the Record ID.

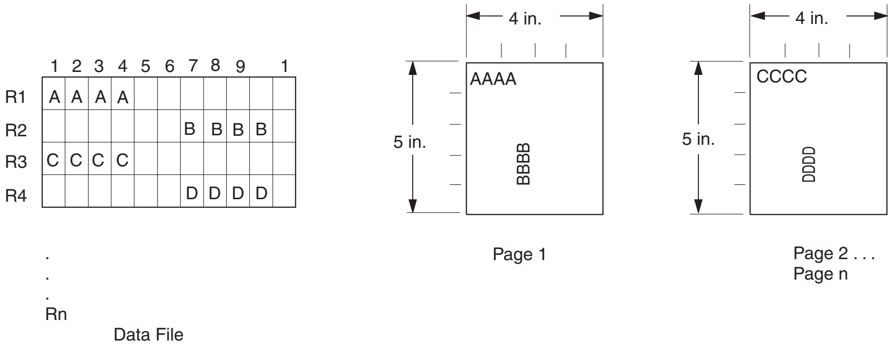


Figure 47. Field Direction

Varying Fonts on a Page

This example illustrates a simple font variation within a printout. The task is to print a line-data file having the first line of each page in bold-faced type and the rest in standard type. This requires controls for two fonts in the page definition.

The commands to select a single font for the page, as shown in Figure 49 on page 78, are as follows:

The **FONT** command contains two names: the local (**STANDARD**) name and the user-access (M101) name for the selected font.

```
PAGEDEF ABCD ;
  FONT STANDARD M101;
  FONT BOLDFACE M102;
  LAYOUT 'abc' FONT BOLDFACE NEWPAGE;
  LAYOUT 'def' FONT STANDARD NEWPAGE;
  LAYOUT 'ghi' FONT STANDARD;
```

Note: Fonts cannot be an FGID (Font Typeface Global Identifier). Also, all page definitions require a **LAYOUT** command.

The following example shows line data using a single font:

```
def      Record 1
ghi      Record 2
ghi      Record 3
ghi      Record 4
ghi      Record 5
ghi      Record 6
def      Record 7
ghi      Record 8
ghi      Record 9
def      Record 10
ghi      Record 11
ghi      Record 12
ghi      Record 13
```

Figure 48. Line Data for Single Font Example

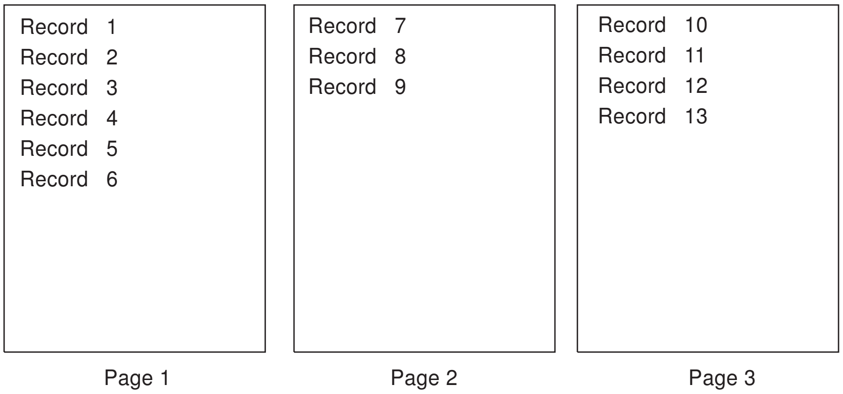


Figure 49. Data File Printed Using a Single Font

This command stream works on the principle that each line of output whose font you want to change from the font in the previous line must be controlled by a separate **LAYOUT** command. The **FONT** subcommand of the **LAYOUT** command names the font desired for that line. In this example, two **LAYOUT** commands are used because one font change and two fonts are intended for the output. The user-access font names appear in the two FONT commands immediately below the **PAGEDEF** command and, optionally, a local name. M101 and M102 in the example are user-access names; **BOLDFACE** is a local name. Use the local name in the **FONT** subcommand of **LAYOUT** if it is included in the corresponding **FONT** command, as is done for the first **LAYOUT** command.

```
abc      Record 1
ghi      Record 2
ghi      Record 3
ghi      Record 4
ghi      Record 5
ghi      Record 6
abc      Record 7
ghi      Record 8
ghi      Record 9
abc      Record 10
ghi      Record 11
ghi      Record 12
ghi      Record 13
```

Figure 50. Line Data for Two Font Example

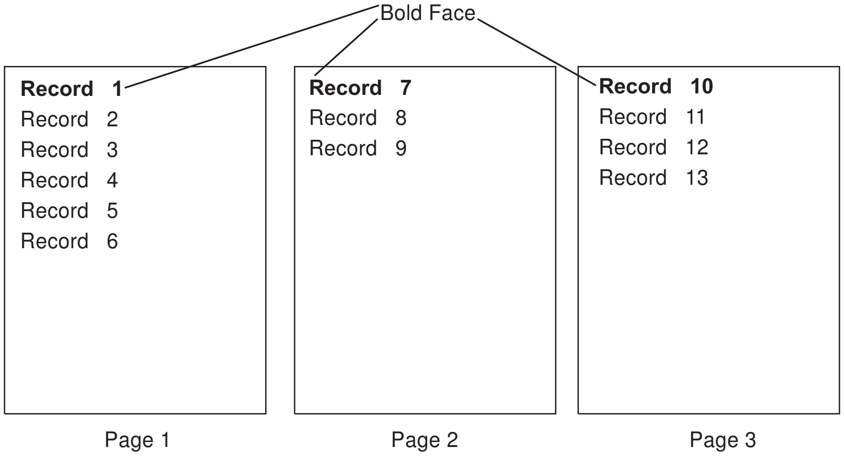


Figure 51. Font Change Using FONT Commands and Subcommands

Changing fonts field by field is similar to changing them in layouts. You map each field individually with a **FIELD** command; include a **FONT** subcommand in the **FIELD** command. If a font change is desired for a field, as with the **FONT** subcommand of a **LAYOUT** command, the font must be previously named in a **FONT** command.

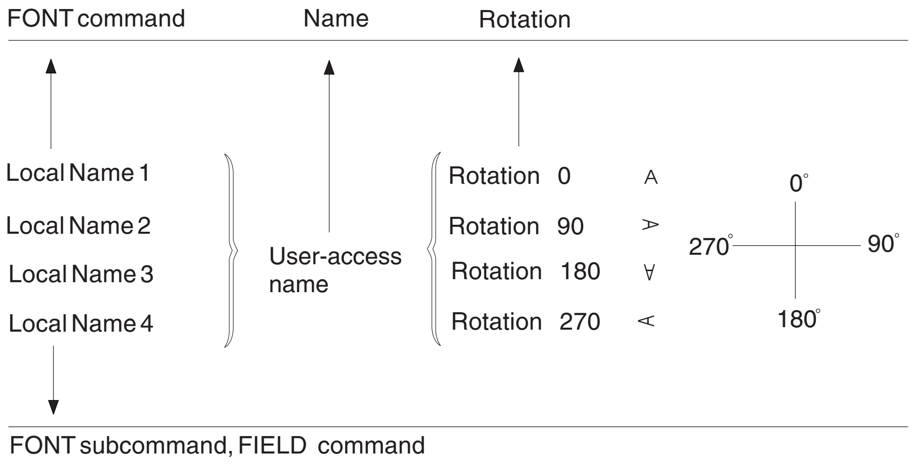
Rotating Fonts

Fonts rotate relative to the inline direction of lines (or fields).

This example focuses on a single letter A from FONTA. With PPFA, a single font specified in a page definition can produce letters in any of four rotations. This is accomplished by a **FONT** command that specifies rotation. If, as in this example, you want to vary the rotation of a font twice within a page, you use two **FONT** commands, one for each rotation. You also use two **LAYOUT** commands to map the data to the printout, using the two rotations of the font. In a field processing application, **FIELD** commands can be used in the same way. These **LAYOUT** commands name the rotated font in a **FONT** subcommand.

Figure 52 breaks down the elements required for the **FONT** commands and subcommands. Distinct local names and rotation specifications for each font are placed in a **FONT** command. These identify a font as rotated within a page definition. The rotation of a character is relative to the inline direction of a field or **LAYOUT**. The characters and rotations shown here assume an inline direction of **ACROSS**.

Figure 52. Character Rotation



You can use up to 16 possible combinations of logical page direction and font rotation for page printers other than the 3800.

The **FONT** subcommands within **LAYOUT** or **FIELD** commands that name the rotated font in that page definition use only the local name. The following command stream shows the proper specification and nesting of **FONT** commands and subcommands for rotation.

```
PAGEDEF ABCD ;
  FONT FONTA M103 ;              /*NO ROTATION, LOCAL AND          */
                                 /*USER-ACCESS NAMES.              */
  FONT FONTARTD180 M103          /*ROTATED FONT, LOCAL, USER-ACCESS*/
       ROTATION 180 ;            /*NAMES PLUS ROTATION SUBCOMMAND  */
                                 /*AND PARAMETER.                  */
  LAYOUT 'abc' FONT FONTA ;      /*LOCAL NAME                      */
  LAYOUT 'def' FONT FONTARTD180 ; /*LOCAL NAME                     */
```

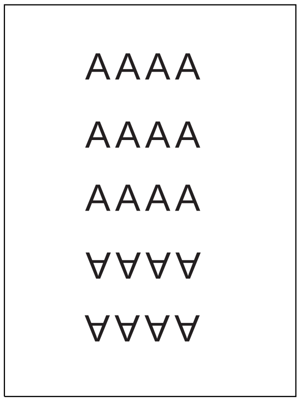


Figure 53. Example of Assumed Data File and Rotation Specifications

FONTA, identified in the first **FONT** command, requires no rotation parameter because it is printed in the default position (or 0° rotation) for font M103. For the rotated font, the second **FONT** command identifies FONTARTD180 (the local name) as M103 rotated 180°.

Using Traditional Kanji Formatting

Traditional kanji print presentation, called *tate*, is possible with your print server printers, using a combination of font rotation and logical page direction. A logical page in the **DOWN** direction and a 270° font rotation provide the right combination to present kanji in tate format on a print server printer.

```
FORMDEF TATE
        OFFSET 1 IN 1 IN ;
PAGEDEF TATE
        HEIGHT 5 IN
        WIDTH 6 IN
        DIRECTION DOWN ;
  FONT  KANJIRTD  M104
        ROTATION 270 ;
  LAYOUT 'tate' FONT KANJIRTD;
```

Figure 54 shows the result of formatting with the above page definition. The characters are added to lines down the page. Lines are added right to left.

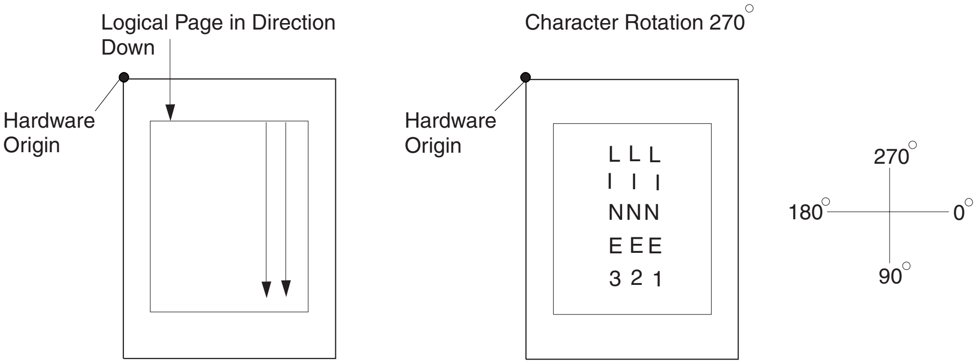


Figure 54. AFP Printer Tate Presentation

Record Formatting Examples

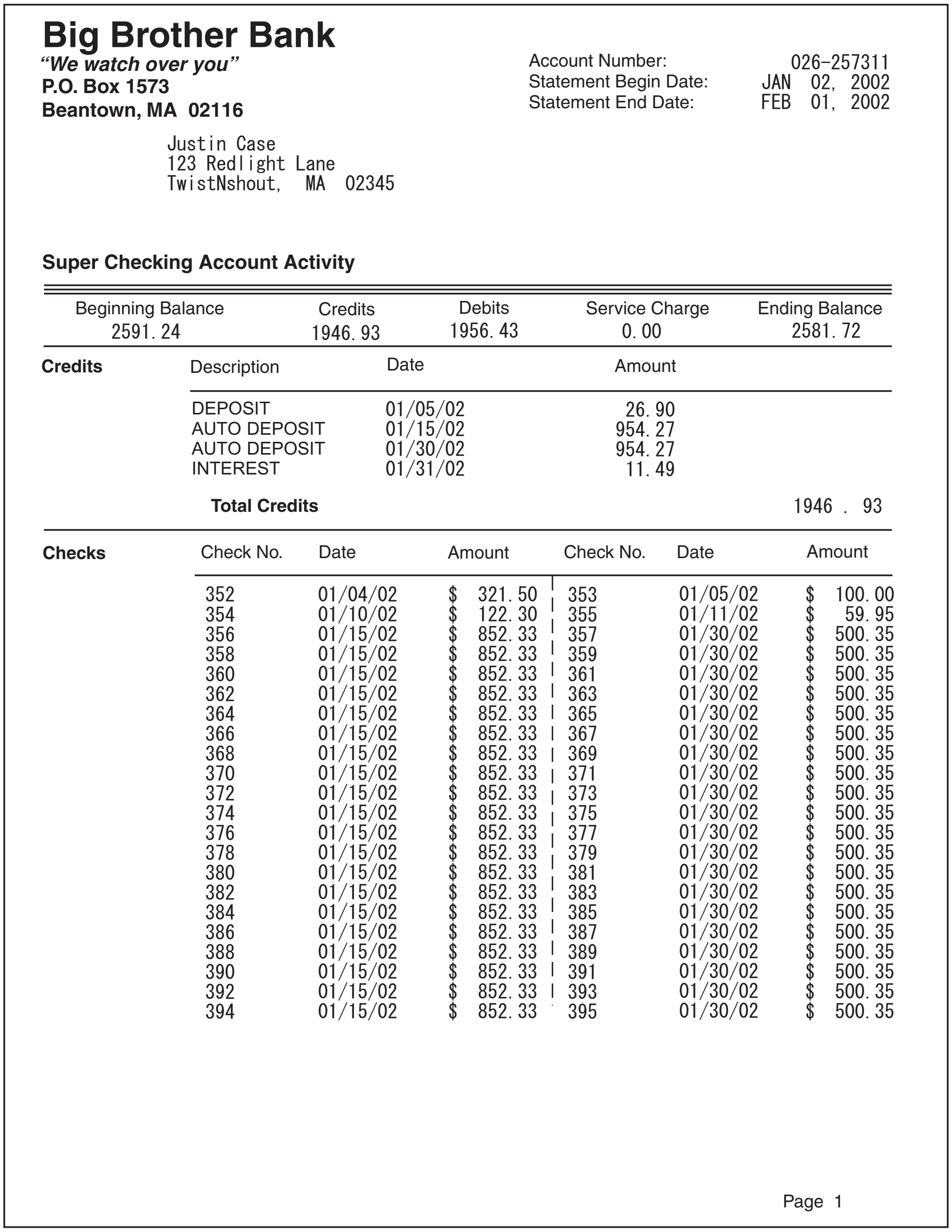
In order to allow different formats for different groups (or tables) of data, each of which have an unpredictable number of entries, a Record ID is assigned to each output record to identify the type of record and control layout formatting. An application can group data fields that are to be formatted together as an entity into Data Records with a specific Record ID. For example, in a bank statement, the data fields for a check transaction might be grouped together with a Record ID identifying that record as a check transaction. The **PAGEDEF** would then define a special layout format for a check transaction with a matching Record ID.

The same thing could be done for a deposit transaction, customer account information, deposit totals, check totals, etc. If the customer account information is going to be used in a page header on each page, the **PAGEDEF** can define a special layout format for a customer information record that automatically generates a page header for each page.

This section shows two complete examples using the record formatting process. Each is divided into three parts - the desired output (after **PAGEDEF** processing), the application output (before **PAGEDEF** processing), and the PPFA commands.

Example 1 Desired Output (after PAGEDEF Processing)

The example user data along with the PPFA commands are meant to create this printed output. (The following page has been resized to fit the format of this User's Guide.)



Big Brother Bank

"We watch over you"
P.O. Box 1573
Beantown, MA 02116

Account Number:	026-257311
Statement Begin Date:	JAN 02, 2002
Statement End Date:	FEB 01, 2002

Justin Case
123 Redlight Lane
TwistNshout, MA 02345

Super Checking Account Activity

Beginning Balance	Credits	Debits	Service Charge	Ending Balance
2591.24	1946.93	1956.43	0.00	2581.72

Credits

Description	Date	Amount
DEPOSIT	01/05/02	26.90
AUTO DEPOSIT	01/15/02	954.27
AUTO DEPOSIT	01/30/02	954.27
INTEREST	01/31/02	11.49

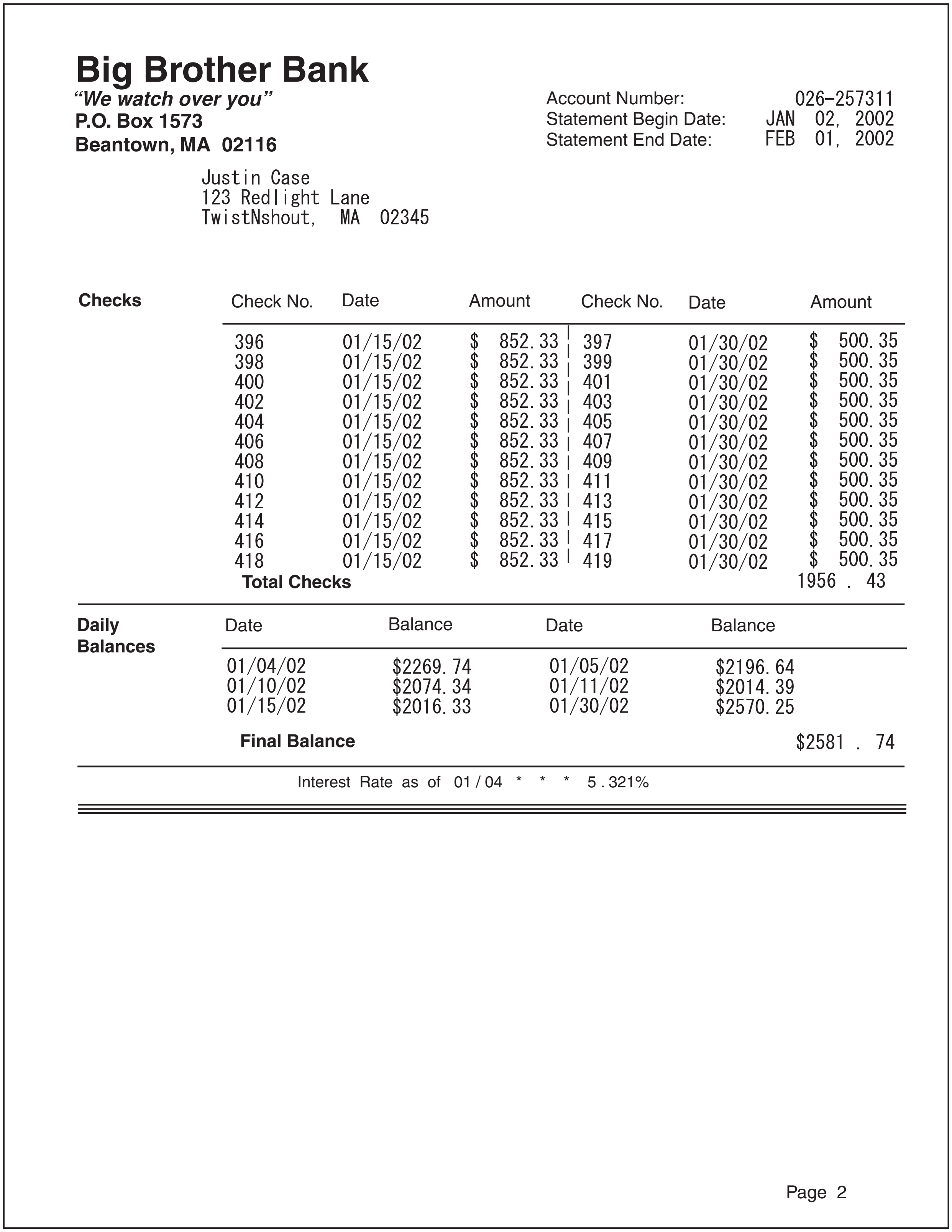
Total Credits 1946 . 93

Checks

Check No.	Date	Amount	Check No.	Date	Amount
352	01/04/02	$ 321.50	353	01/05/02	$ 100.00
354	01/10/02	$ 122.30	355	01/11/02	$ 59.95
356	01/15/02	$ 852.33	357	01/30/02	$ 500.35
358	01/15/02	$ 852.33	359	01/30/02	$ 500.35
360	01/15/02	$ 852.33	361	01/30/02	$ 500.35
362	01/15/02	$ 852.33	363	01/30/02	$ 500.35
364	01/15/02	$ 852.33	365	01/30/02	$ 500.35
366	01/15/02	$ 852.33	367	01/30/02	$ 500.35
368	01/15/02	$ 852.33	369	01/30/02	$ 500.35
370	01/15/02	$ 852.33	371	01/30/02	$ 500.35
372	01/15/02	$ 852.33	373	01/30/02	$ 500.35
374	01/15/02	$ 852.33	375	01/30/02	$ 500.35
376	01/15/02	$ 852.33	377	01/30/02	$ 500.35
378	01/15/02	$ 852.33	379	01/30/02	$ 500.35
380	01/15/02	$ 852.33	381	01/30/02	$ 500.35
382	01/15/02	$ 852.33	383	01/30/02	$ 500.35
384	01/15/02	$ 852.33	385	01/30/02	$ 500.35
386	01/15/02	$ 852.33	387	01/30/02	$ 500.35
388	01/15/02	$ 852.33	389	01/30/02	$ 500.35
390	01/15/02	$ 852.33	391	01/30/02	$ 500.35
392	01/15/02	$ 852.33	393	01/30/02	$ 500.35
394	01/15/02	$ 852.33	395	01/30/02	$ 500.35

Page 1

Figure 55. Part one of Sample Graphic Created by the Following User Data and PPFA Commands.



Big Brother Bank
"We watch over you"
P.O. Box 1573
Beantown, MA 02116

Account Number: 026-257311
Statement Begin Date: JAN 02, 2002
Statement End Date: FEB 01, 2002

Justin Case
123 Redlight Lane
TwistNshout, MA 02345

Checks

Check No.	Date	Amount	Check No.	Date	Amount
396	01/15/02	$ 852.33	397	01/30/02	$ 500.35
398	01/15/02	$ 852.33	399	01/30/02	$ 500.35
400	01/15/02	$ 852.33	401	01/30/02	$ 500.35
402	01/15/02	$ 852.33	403	01/30/02	$ 500.35
404	01/15/02	$ 852.33	405	01/30/02	$ 500.35
406	01/15/02	$ 852.33	407	01/30/02	$ 500.35
408	01/15/02	$ 852.33	409	01/30/02	$ 500.35
410	01/15/02	$ 852.33	411	01/30/02	$ 500.35
412	01/15/02	$ 852.33	413	01/30/02	$ 500.35
414	01/15/02	$ 852.33	415	01/30/02	$ 500.35
416	01/15/02	$ 852.33	417	01/30/02	$ 500.35
418	01/15/02	$ 852.33	419	01/30/02	$ 500.35
Total Checks					1956 . 43

Daily Balances

Date	Balance	Date	Balance
01/04/02	$2269.74	01/05/02	$2196.64
01/10/02	$2074.34	01/11/02	$2014.39
01/15/02	$2016.33	01/30/02	$2570.25
Final Balance			$2581 . 74

Interest Rate as of 01 / 04 * * * 5 . 321%

Page 2

Figure 56. Part two of Sample Graphic Created by the Following User Data and PPFA Commands..

Example 1 Application Output (before PAGEDEF Processing)

Each layout record contains all information for a given layout. Because of lack of space, only the first 80 bytes are shown here. The first 10 characters must contain the layout id.

```
         11111111112222222222333333333344444444445555555555666666666677777777778
12345678901234567890123456789012345678901234567890123456789012345678901234567890
statmid   026-257311Justin Case  123 Redlight Lane  Twistnshout   MA    02345
statsum   $2591.24 $1946.93  $1956.43  $0.00  $2581.72
pgenum
crheader
crdata    DEPOSIT      01/05/02  $  26.90
crdata    AUTO DEPOSIT 01/15/02  $ 954.27
crdata    AUTO DEPOSIT 01/30/02  $ 954.27
crdata    INTEREST     01/31/02  $  11.49
crtotal                          $1946.93
ckheader
ckdatal    352         01/04/02  $ 321.50
ckdatar    353         01/05/02  $ 100.00
ckdatal    354         01/10/02  $ 122.30
ckdatar    355         01/11/02  $  59.95
ckdatal    356         01/15/02  $ 852.33
ckdatar    357         01/30/02  $ 500.35
ckdatal    358         01/15/02  $ 852.33
ckdatar    359         01/30/02  $ 500.35
ckdatal    360         01/15/02  $ 852.33
ckdatar    361         01/30/02  $ 500.35
ckdatal    362         01/15/02  $ 852.33
ckdatar    363         01/30/02  $ 500.35
ckdatal    364         01/15/02  $ 852.33
ckdatar    365         01/30/02  $ 500.35
ckdatal    366         01/15/02  $ 852.33
ckdatar    367         01/30/02  $ 500.35
ckdatal    368         01/15/02  $ 852.33
ckdatar    369         01/30/02  $ 500.35
ckdatal    370         01/15/02  $ 852.33
ckdatar    371         01/30/02  $ 500.35
ckdatal    372         01/15/02  $ 852.33
ckdatar    373         01/30/02  $ 500.35
ckdatal    374         01/15/02  $ 852.33
ckdatar    375         01/30/02  $ 500.35
ckdatal    376         01/15/02  $ 852.33
ckdatar    377         01/30/02  $ 500.35
ckdatal    378         01/15/02  $ 852.33
ckdatar    379         01/30/02  $ 500.35
ckdatal    380         01/15/02  $ 852.33
ckdatar    381         01/30/02  $ 500.35
ckdatal    382         01/15/02  $ 852.33
ckdatar    383         01/30/02  $ 500.35
ckdatal    384         01/15/02  $ 852.33
ckdatar    385         01/30/02  $ 500.35
ckdatal    386         01/15/02  $ 852.33
ckdatar    387         01/30/02  $ 500.35
ckdatal    388         01/15/02  $ 852.33
ckdatar    389         01/30/02  $ 500.35
ckdatal    390         01/15/02  $ 852.33
ckdatar    391         01/30/02  $ 500.35
ckdatal    392         01/15/02  $ 852.33
ckdatar    393         01/30/02  $ 500.35
ckdatal    394         01/15/02  $ 852.33
ckdatar    395         01/30/02  $ 500.35
ckdatal    396         01/15/02  $ 852.33
ckdatar    397         01/30/02  $ 500.35
ckdatal    398         01/15/02  $ 852.33
ckdatar    399         01/30/02  $ 500.35
ckdatal    400         01/15/02  $ 852.33
```

```
ckdatar    401         01/30/02  $ 500.35
ckdatal    402         01/15/02  $ 852.33
ckdatar    403         01/30/02  $ 500.35
ckdatal    404         01/15/02  $ 852.33
ckdatar    405         01/30/02  $ 500.35
ckdatal    406         01/15/02  $ 852.33
ckdatar    407         01/30/02  $ 500.35
ckdatal    408         01/15/02  $ 852.33
ckdatar    409         01/30/02  $ 500.35
ckdatal    410         01/15/02  $ 852.33
ckdatar    411         01/30/02  $ 500.35
ckdatal    412         01/15/02  $ 852.33
ckdatar    413         01/30/02  $ 500.35
ckdatal    414         01/15/02  $ 852.33
ckdatar    415         01/30/02  $ 500.35
ckdatal    416         01/15/02  $ 852.33
ckdatar    417         01/30/02  $ 500.35
ckdatal    418         01/15/02  $ 852.33
ckdatar    419         01/30/02  $ 500.35
cktotal                          $1956.43
balhead
baldatal               01/04/02  $2269.74
baldatar               01/05/02  $2196.64
baldatal               01/10/02  $2074.34
baldatar               01/11/02  $2014.39
baldatal               01/15/02  $2016.33
baldatar               01/30/02  $2570.25
baltotal                         $2581.74
statrail
```

Example 1 PPFA Commands

```
PAGEDEF justin replace yes
          WIDTH 8.5 in
          HEIGHT 11.0 in;
    FONT  comp  a075nc ;    /*Big Brother Bank font  */
    FONT  ital  a175dc ;    /*Italic theme           */
    FONT  addr  a075dc ;    /*Big Brother address    */
    FONT  varb  gt10   ;    /*Variable data          */
    FONT  super a075dc ;    /*Super Checking Account */
    FONT  head   a055ac;    /*Headings               */
    FONT  bhead  a075ac;    /*Bold Headings          */

PAGEFORMAT  chub1   TOPMARGIN 2 in BOTMARGIN  2 in;
/************************************************/
/** statmid  BODY                              **/
/************************************************/
LAYOUT  C'statmid'  PAGEHEADER NEWPAGE
   POSITION .6 in ABSOLUTE .55 in;
  FIELD  TEXT C'Big Brother Bank'  ALIGN LEFT
   FONT comp ;   /* default to LAYOUT positioning*/
 FIELD  TEXT C'"We watch over you"' ALIGN LEFT
   POSITION   0 NEXT
        FONT ital ; /*default to next line          */
 FIELD  TEXT C'P.O. Box 1573' ALIGN LEFT
   POSITION   0 NEXT
       FONT addr ; /*default to next line          */
 FIELD  TEXT C'Beantown, MA  02116' ALIGN LEFT
   POSITION   0 NEXT
   FONT addr ; /*default to next line          */
   FIELD  TEXT C'Account Number:' ALIGN LEFT
   POSITION   4.3 in .2 in
   FONT head ; /*New area on right             */
 FIELD  TEXT C'Statement Begin Date:' ALIGN LEFT
         POSITION  4.3 in  NEXT
   FONT head ; /*New area on right             */
 FIELD  TEXT C'Statement End Date:' ALIGN LEFT
   POSITION  4.3 in  NEXT
   FONT head ; /*New area on right             */
 FIELD  START  1 LENGTH 10 ALIGN RIGHT
   POSITION  7.5 in .2 in
             FONT varb ; /*variable - account number*/
 FIELD  START 75 LENGTH 12
   POSITION  7.5 in  NEXT
   ALIGN RIGHT /* data is missing from example */
   FONT varb ; /*variable - begin date         */
 FIELD  START 88 LENGTH 12
   POSITION  7.5 in  NEXT
     ALIGN RIGHT /* data is missing from example */
   FONT varb ; /*variable - end date           */
 FIELD  START 11 LENGTH 19 ALIGN LEFT
   POSITION  1.1 in  .9 in
             FONT varb ; /*variable - customer name */
   FIELD  START 30 LENGTH 19          ALIGN LEFT
   POSITION  1.1 in  NEXT
   FONT varb ; /*variable - customer address   */
 FIELD  START 49 LENGTH 22          ALIGN LEFT
         POSITION  1.1 in  NEXT
   FONT varb ; /*variable - customer city, st. */

/************************************************/
/** statsum  BODY                              **/
/************************************************/
LAYOUT C'statsum'  BODY
   POSITION .6 in .5 in;
 FIELD  TEXT C'Super Checking Account Activity'
   FONT super ; /* Static text - Super Checking */
```

```
 DRAWGRAPHIC LINE  ACROSS 7.5 IN LINEWT BOLD
   POSITION  0  .15 in
   copy   down 2 spaced 1 mm;
 FIELD  TEXT C'Beginning Balance'
   POSITION  .3 in .4 in
   FONT head  ; /* Static text - first header   */
 FIELD  TEXT C'Credits'
   POSITION 2.4 in CURRENT
   FONT head  ; /* Static text - first header   */
 FIELD  TEXT C'Debits'
   POSITION 3.6 in CURRENT
     FONT head  ; /* Static text - first header   */
   FIELD  TEXT C'Service Charge'
   POSITION 4.8 in CURRENT
       FONT head  ; /* Static text - first header   */
   FIELD  TEXT C'Ending Balance'
   POSITION 6.3 in CURRENT
     FONT head  ; /* Static text - first header   */
   FIELD  START  1  LENGTH  8
   POSITION  .6 in .6 in
       FONT varb  ; /* Variable text - Beg balance  */
  FIELD  START 10  LENGTH  8
   POSITION 2.2 in CURRENT
      FONT varb  ; /* Variable text - Credits      */
   FIELD  START 20  LENGTH  8
   POSITION 3.4 in CURRENT
       FONT varb  ; /* Variable text - Debits       */
   FIELD  START 30  LENGTH  5
   POSITION 5.0 in CURRENT
       FONT varb  ; /* Variable text - Service Chrg */
   FIELD  START 40  LENGTH  8
   POSITION 6.5 in CURRENT
       FONT varb  ; /* Variable text - End Balance  */
   DRAWGRAPHIC LINE  ACROSS 7.5 IN LINEWT BOLD
   POSITION  0 .7 in;

/***********************************************/
/** crheader GROUPHEADER                      **/
/***********************************************/
LAYOUT C'crheader'  GRPHEADER XSPACE .2 in
   POSITION SAME .9 in;
 FIELD  TEXT C'Credits'
   FONT bhead ; /* Static text - Credits        */
 FIELD  TEXT C'Description'
         POSITION  1.3 in   CURRENT
   FONT head  ; /* Stat text - Deposit Descr.   */
 FIELD  TEXT C'Date'
     POSITION  3.2 in   CURRENT
   FONT  head ; /* Static text - Date           */
 FIELD  TEXT C'Amount'
        POSITION  5.0 in   CURRENT
   FONT  head ; /* Stat text - Amount of deposit*/
 DRAWGRAPHIC LINE  ACROSS 6.2 IN LINEWT BOLD
   POSITION 1.3 in next;

/***********************************************/
/** crdata   BODY                             **/
/***********************************************/
LAYOUT C'crdata'   BODY  GROUP;
 FIELD  START  1 LENGTH 13
       POSITION  1.3 in  CURRENT
   FONT  varb ; /* Variable text - Description  */
 FIELD  START 14 LENGTH 8
       POSITION  3 in  CURRENT
   FONT  varb ; /* Variable text - Date         */
 FIELD  START 24 LENGTH 8     ALIGN RIGHT
   POSITION  5.6 in  CURRENT
```

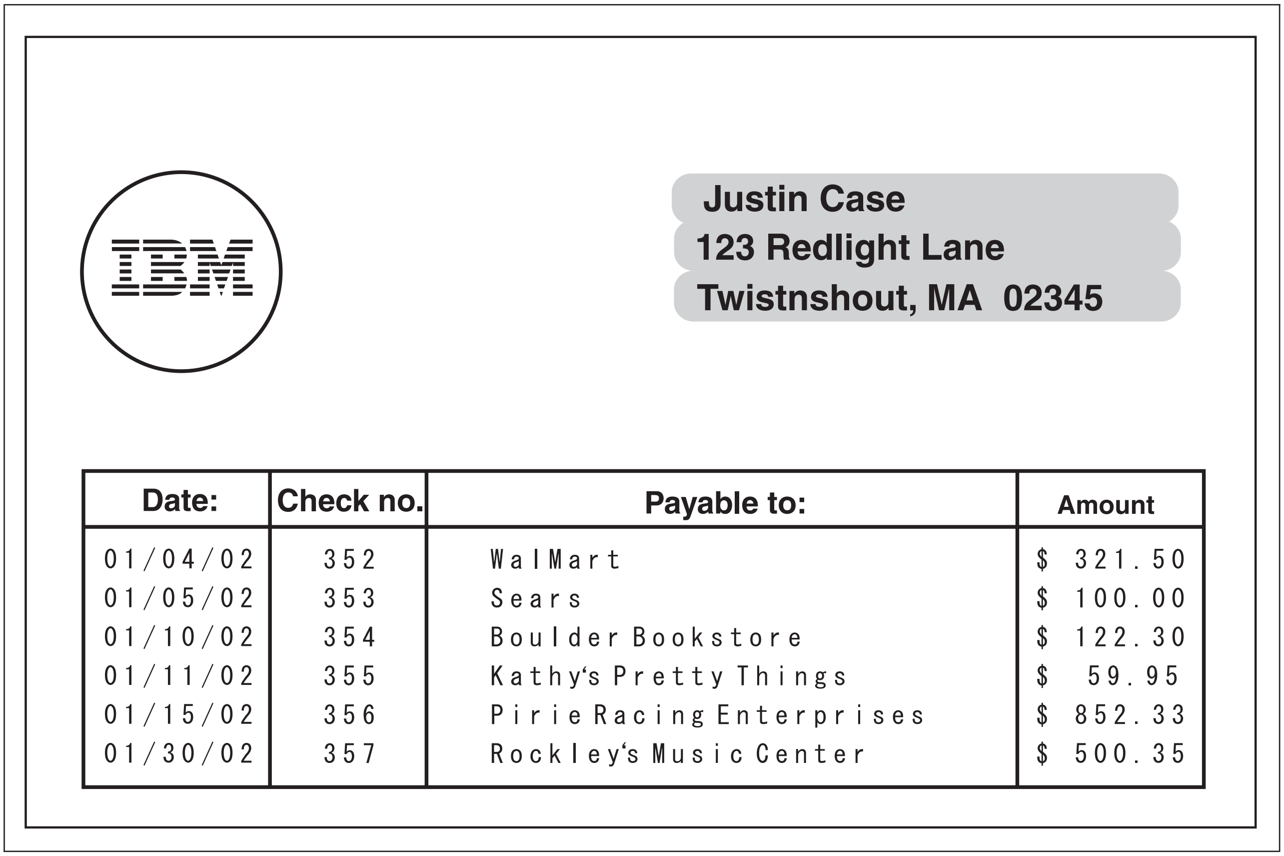
```
     FONT  varb  ; /* Variable text - Amount       */

/************************************************/
/** crtotal  BODY                              **/
/************************************************/
LAYOUT C'crtotal'  BODY  GROUP;
 FIELD  TEXT C'Total Credits'
       POSITION  1.5 in   .2 in
   FONT bhead ; /* Stat text - Total credits    */
 FIELD  START 24 LENGTH 8   ALIGN RIGHT
   POSITION  7.3 in  CURRENT
     FONT  varb  ; /* Variable text - Amount      */
 DRAWGRAPHIC LINE ACROSS 7.5 IN LINEWT BOLD
   POSITION   0  next;

/************************************************/
/**  ckheader  GROUPHEADER                     **/
/************************************************/
LAYOUT C'ckheader' GRPHEADER XSPACE .2 in
   POSITION  SAME .6 in;
 FIELD  TEXT C'Checks'
   FONT bhead ; /* Static text - Checks         */
 FIELD  TEXT C'Check No.'
         POSITION  1.4 in   CURRENT
   FONT  head ; /* Stat text - Check number     */
 FIELD  TEXT C'Date'
       POSITION  2.5 in   CURRENT
   FONT  head  ;/* Stat text - Date of check    */
 FIELD  TEXT C'Amount'
       POSITION  3.5 in   CURRENT
   FONT  head  ;/* Static text - Amount of check*/
 FIELD  TEXT C'Check No.'
        POSITION  4.6 in   CURRENT
   FONT  head ; /* Stat text - Check number     */
 FIELD  TEXT C'Date'
        POSITION  5.6 in   CURRENT
   FONT  head  ;/* Stat text - Date of check    */
 FIELD  TEXT C'Amount'
        POSITION  6.8 in   CURRENT
   FONT  head  ;/* Static text - Amount of check*/
 DRAWGRAPHIC LINE  ACROSS 6.2 IN LINEWT BOLD
   POSITION 1.3 in next;
 DRAWGRAPHIC LINE  DOWN LINETYPE shortdash
   POSITION 4.5 in CPOS;

/************************************************/
/**  ckdatal BODY left side                    **/
/************************************************/
LAYOUT C'ckdatal'  BODY  GROUP
   POSITION SAME NEXT;
 FIELD  START  2 LENGTH 3
   POSITION 1.4 in  CURRENT
        FONT  varb  ; /* Variable text - Check number */
   FIELD  START 14 LENGTH 8
   POSITION  2.4 in  CURRENT
        FONT  varb  ; /* Variable text - Date         */
   FIELD  START 24 LENGTH 8  ALIGN RIGHT
   POSITION  4.4 in   CURRENT
   FONT  varb  ; /* Variable text - Amount  */

/************************************************/
/**  ckdatar BODY right side                   **/
/************************************************/
LAYOUT C'ckdatar'  BODY  GROUP
   POSITION SAME SAME;
   FIELD  START  2  LENGTH 3
   POSITION  4.6 in  CURRENT
```

```
       FONT  varb  ; /* Variable text - Check number */
   FIELD  START 14 LENGTH 8
   POSITION  5.6 in  CURRENT
       FONT  varb  ; /* Variable text - Date         */
   FIELD  START 24 LENGTH 8   ALIGN RIGHT
   POSITION 7.5 in  CURRENT
   FONT  varb  ; /* Variable text - Amount       */

/************************************************/
/** cktotal  BODY                              **/
/************************************************/
LAYOUT C'cktotal'  BODY  GROUP;
 ENDGRAPHIC LPOS;  /*ends dashed line between checks */
 FIELD  TEXT C'Total Checks'
        POSITION  1.5 in   .2 in
   FONT bhead ; /* Stat text - Total checks      */
 FIELD  START 24 LENGTH 8  ALIGN RIGHT
   POSITION  7.3 in  CURRENT
     FONT  varb  ; /* Variable text - Amount       */
 DRAWGRAPHIC LINE ACROSS 7.5 IN LINEWT BOLD
   POSITION   0   next;

/************************************************/
/** balhead  GROUPHEADER                       **/
/************************************************/
LAYOUT C'balhead'   GRPHEADER XSPACE .2 in
   POSITION SAME .6 in;
 FIELD  TEXT C'Daily'
   FONT bhead ; /* Static text - Daily Balance  */
 FIELD  TEXT C'Date'
        POSITION  1.3 in   CURRENT
   FONT  head  ;/* Stat text - Date of balance  */
 FIELD  TEXT C'Balance'
       POSITION  2.8 in   CURRENT
   FONT  head  ;/* Static text - Balance        */
 FIELD  TEXT C'Date'
         POSITION  4.3 in   CURRENT
   FONT  head  ; / Stat text - Date of balance  */
 FIELD  TEXT C'Balance'
       POSITION  5.8 in   CURRENT
   FONT  head  ; /*Static text - Balance        */
 FIELD  TEXT C'Balances'
       POSITION  0  NEXT
   FONT bhead  ; /*Static text - Daily Balance  */
 DRAWGRAPHIC LINE  ACROSS 6.2 IN LINEWT BOLD
       POSITION 1.3 in CPOS;

/************************************************/
/** baldatal BODY  left side                   **/
/************************************************/
LAYOUT C'baldatal'  BODY  GROUP
   POSITION SAME  NEXT;
 FIELD  START 14 LENGTH 8
   POSITION 1.3 in  CURRENT
       FONT  varb  ; /* Variable text - Date        */
   FIELD  START 24 LENGTH 8    ALIGN RIGHT
   POSITION 3.6 in  CURRENT
   FONT  varb  ; /* Variable text - Amount      */

/************************************************/
/** baldatar BODY  right side                  **/
/************************************************/
LAYOUT C'baldatar'  BODY  GROUP
   POSITION SAME  SAME;
  FIELD  START 14 LENGTH 8
   POSITION 4.3 in  CURRENT
         FONT  varb  ; /* Variable text - Date        */
```

```
   FIELD  START 24 LENGTH 8   ALIGN RIGHT
   POSITION 6.6 in  CURRENT
   FONT  varb  ; /* Variable text - Amount      */

/************************************************/
/** baltotal BODY                              **/
/************************************************/
LAYOUT C'baltotal'  BODY  GROUP;
 FIELD  TEXT C'Final Balance'
        POSITION  1.5 in   .2 in
   FONT bhead ; /* Stat text - Final balance     */
 FIELD  START 24 LENGTH 8    ALIGN RIGHT
   POSITION  7.3 IN CURRENT
    FONT  varb  ; /* Variable text - Amount       */

/************************************************/
/** statrail BODY                              **/
/************************************************/
LAYOUT C'statrail'  BODY
   POSITION SAME .4 in;
 DRAWGRAPHIC LINE  ACROSS 7.5 IN LINEWT BOLD
   POSITION 0 CPOS;
 FIELD TEXT C'Interest Rate '
   POSITION  2.0 in NEXT
        FONT bhead ; /* Static text - Interest rate   */
 FIELD  TEXT C'As of 01/04  * * *  5.321%'
   POSITION  CURRENT CURRENT
        FONT varb ;  /* Static text                  */
 DRAWGRAPHIC LINE  ACROSS 7.5 IN LINEWT BOLD
   POSITION 0  NEXT
   copy down 2 spaced 1 mm;

/************************************************/
/** pgenum   PAGE NUMBER                       **/
/************************************************/
LAYOUT C'pgenum'  PAGETRAILER
   POSITION SAME ABSOLUTE 10.7 in;
 FIELD  TEXT C 'Page '
   POSITION 6.5 in CURRENT
        FONT  varb;/* placement of page number      */
   FIELD  PAGENUM PRINT RESET 1 /* request page numbering*/
       FONT  varb /* placement of page number      */
   POSITION CURRENT CURRENT;
```

Example 2 Using Repeated and Unended Boxes

This example shows how to use the repeated box option, a single circle and some unended boxes. (The following example has been resized to fit the format of this User's Guide.)



Justin Case
123 Redlight Lane
Twistnshout, MA 02345

Date:	Check no.	Payable to:	Amount
01/04/02	352	WalMart	$ 321.50
01/05/02	353	Sears	$ 100.00
01/10/02	354	Boulder Bookstore	$ 122.30
01/11/02	355	Kathy‘s Pretty Things	$ 59.95
01/15/02	356	Pirie Racing Enterprises	$ 852.33
01/30/02	357	Rockley‘s Music Center	$ 500.35

Figure 57. Example Showing How to Use the Repeating Box Option

Example 2 Application Output (before PAGEDEF Processing)

```
         11111111112222222222333333333344444444445555555555666666666677
12345678901234567890123456789012345678901234567890123456789012345678901

statmid    Justin Case        123 Redlight Lane  Twistnshout   MA 02345
ckheader
ckdata     352         01/04/02  $ 321.50   WalMart
ckdata     353         01/05/02  $ 100.00   Sears
ckdata     354         01/10/02  $ 122.30   Boulder Bookstore
ckdata     355         01/11/02  $  59.95   Kathy's Pretty Things
ckdata     356         01/15/02  $ 852.33   Pirie Racing Enterprises
ckdata     357         01/30/02  $ 500.35   Rockley's Music Center
ckend
```

PPFA Input for Repeated Boxes Example 2

```
PAGEDEF rept1   replace yes;
    FONT  addr  a075dc ;           /*customer address       */
    FONT  varb  gt10   ;           /*Variable data          */
    FONT  bhead  a075ac;           /*Bold Headings          */
    SETUNITS  LINESP .25 in ;      /* Line spacing          */

    PAGEFORMAT  rept1   BOTMARGIN  2 in;
    SEGMENT  ibmlog;               /*IBM logo               */
   /************************************************/
```

```
/** statmid  PAGEHEADER                        **/
/************************************************/
 LAYOUT C'statmid'
       SEGMENT ibmlog  1.15 in 1.35 in
       PAGEHEADER NEWPAGE
        POSITION SAME ABSOLUTE NEXT;
   DRAWGRAPHIC  CIRCLE RADIUS .5 in         /* 1 inch circle    */
        POSITION 1.5 in  1.5 in;
   DRAWGRAPHIC  BOX  BOXSIZE 2.6 IN .25 IN ROUNDED LARGE
        LINEWT 0                            /* invisible border */
        POSITION 4 IN 1 IN
        COPY   DOWN 2 SPACED 0
        FILL ALL  DOT02;
   FIELD  START  2 LENGTH 19  ALIGN LEFT
        POSITION  4.2 in 1.2 in
        FONT addr ;    /*variable - customer name      */
   FIELD  START 21 LENGTH 19  ALIGN LEFT
        POSITION  4.2 in NEXT
        FONT addr ;    /*variable - customer address   */
   FIELD  START 40 LENGTH 22  ALIGN LEFT
        POSITION  4.2 in NEXT
         FONT addr ;    /*variable - customer city, st. */
/************************************************/
/**  ckheader  GROUPHEADER                     **/
/************************************************/
 LAYOUT C'ckheader'  GRPHEADER XSPACE .25 in
        POSITION 1 in ABSOLUTE 2.5 in;       /* set position   */
   DRAWGRAPHIC  BOX BOXSIZE .95 IN  .3 IN
        POSITION 0 0;
   DRAWGRAPHIC  BOX BOXSIZE .95 IN        /* box started for data */
        POSITION 0   .3 in;               /* no vertical size */
   FIELD  TEXT C'Date'
        POSITION   .3 in   .2 in
       FONT  bhead  ; /* Stat text - Date of check    */
   DRAWGRAPHIC  BOX  BOXSIZE  .8 IN  .3 IN
        POSITION  .95 IN 0;
   DRAWGRAPHIC  BOX  BOXSIZE .8 IN        /* box started for data */
        POSITION .95 in .3 in;            /* no vertical size     */
   FIELD  TEXT C'Check No.'
        POSITION 1 in   .2 in
        FONT  bhead  ; /* Stat text - Check number     */
   DRAWGRAPHIC  BOX  BOXSIZE  3 IN  .3 IN
        POSITION 1.75 IN  0;
   DRAWGRAPHIC  BOX  BOXSIZE 3 IN         /* box started for data */
        POSITION 1.75 in  .3 in;          /* no vertical size     */
   FIELD  TEXT C'Payable to:'
       POSITION  2.9 in    .2 in
        FONT  bhead  ; /* Static text - Payable to:    */
   DRAWGRAPHIC  BOX BOXSIZE .95 IN  .3 IN
        POSITION 4.75 IN   0 in;
   DRAWGRAPHIC  BOX  BOXSIZE .95 in       /* box started for data */
        POSITION 4.75 in  .3 in;          /* no vertical size     */
   FIELD  TEXT C'Amount'
        POSITION  5 in    .2 in
        FONT  bhead  ; /* Stat text - Amount of check  */
/************************************************/
/**  ckdata  BODY  w/ un-ended boxes           **/
/************************************************/
 LAYOUT C'ckdata'  BODY  GROUP;
   FIELD  START  2 LENGTH 3  ALIGN LEFT
       POSITION 1.2 in  CURRENT
        FONT  varb  ; /* Variable text - Check number */
   FIELD  START 14 LENGTH 8  ALIGN LEFT
       POSITION  .1 in  CURRENT
       FONT  varb  ; /* Variable text - Date         */
   FIELD  START 35 LENGTH 25 ALIGN LEFT
        POSITION  2.0 in   CURRENT
```

```
         FONT  varb  ; /* Variable text - Payable to:  */
   FIELD  START 24 LENGTH 8  ALIGN RIGHT
        POSITION  5.6 in   CURRENT
        FONT  varb  ; /* Variable text - Amount       */
/************************************************/
/**  ckend   BODY  to end boxes               **/
/************************************************/
 LAYOUT C'ckend' BODY  GROUP;  /* If this layout and command are  */
   ENDGRAPHIC LPOS;            /* not issued, the boxes should be */
                               /* closed anyway. But if there was */
                               /* a trailer, they may not end in  */
                               /* the right place.                */
```

XML Page Definition Formatting Function

The XML page definition formatting function allows an application to specify formatting instructions for XML data by specifying an **XLAYOUT** command with specific formatting instructions for the data. The **XLAYOUT** command addresses an XML data item by specifying a **QTAG** (qualified tag) for that data. A **QTAG** is a series of XML start tags that fully identify the XML data item. For example, in Figure 58 on page 97, for your customer's first name, the **QTAG** would be `Customer`, `name`, and `first`. To define a local name "first" for easy reference you could use the following **DEFINE** command:

```
DEFINE first QTAG 'Customer','name','first';
```

and reference it with the following **XLAYOUT** command using the defined local name "first":

```
XLAYOUT first POSITION ...;
```

Before printing the data, PSF scans the XML data item and matches it to an **XLAYOUT** command in the page definition by using its **QTAG**. The matching **XLAYOUT** command in the page definition is used to position and format the associated XML data item and its attributes on the printed page.

The XML page definition function has the following new PPFA concepts:

Relative Inline Positioning:

Relative inline positioning places data relative to the current position. If you position a text field and then place the text, the end of the text becomes the new current position. Graphics, barcodes, objects, segments, and overlays ***do not*** change the current position after they are originally positioned. For example, if you position a line with a **DRAWGRAPHIC LINE** command, the new current position is the starting point of that line. The length of the graphic line does not change the current position.

There are several restrictions when using relative inline positioning:

1. **XLAYOUT** commands with relative positioning cannot contain any of the following:
   - **FIELD** commands with inline positioning relative to the **XLAYOUT** (**LPOS**)
   - **FIELD ATTR** (attribute) with inline positioning relative to the **XLAYOUT** (**LPOS**)
   - **FIELD** commands with barcodes
   - **DRAWGRAPHIC** commands
   - **OBJECT** subcommands
   - **SEGMENT** subcommands
   - **OVERLAY** subcommands
2. You can only use the **SAME** parameter for inline positioning on the **XLAYOUT** command when the previously used **XLAYOUT** command used absolute inline positioning.

Absolute Inline Positioning:

Allows absolute inline positioning on a **FIELD** command for specific placement of elements.

Attributes are Special FIELDs:

The attribute is identified by name and the data printed is from the attribute value or a portion of the attribute value and not from the element content.

Notes:

1. If a **FIELD** is used for presenting any piece of data on the **XLAYOUT** command, **FIELD** commands must be used for all pieces of data presented on the **XLAYOUT** command. Since an attribute is a special field, if you want to print both an attribute value and the element data you need to code the attribute field for the attribute value and a regular field for the element data.
2. PSF suppresses leading and trailing blanks (X'40' for EBCDIC or X'20' for ASCII) in the data. Multiple embedded blanks are reduced to one blank.

POSITION Subcommand

The **POSITION** subcommand on each **XLAYOUT** command specifies the starting layout position in the printout. The **POSITION** subcommand on the **FIELD** command specifies a field position relative to the governing **XLAYOUT** position.

Relative Baseline Position

See the *Advanced Function Presention: Programming Guide and Line Data Reference*, S544-3884 for more detailed information on RCD and XMD processing.

Relative Baseline Position: The baseline position corresponds to the `y`-pos position in PPFA and the inline position corresponds to the `x`-pos position.

If the baseline position is relative, the offset is measured as follows:

- For Page Header, the offset is relative to the top of the page.
- For Page Trailer, it is relative to the last Record processed; if there is none, it is relative to the top margin.
- For Group Header and Body, the offset is relative to the last Group Header or Body processed; if there is none, it is relative to the top margin.
- For Field, it is relative to the last Field or Body that was processed for print (whether or not data is printed).

The inline position is not changed in the case where there is no data to print.

For Example:

```
XLAYOUT text1
        POSITION 6 mm 8 mm;
        FIELD ATTR 'attr1' FONT FONT03;
        FIELD ATTR 'attr2' FONT FONT03 POSITION 20 mm 5 mm;
        FIELD ATTR 'attr3' FONT FONT03;

attr1 = abcdefg
attr2 = W
attr3 = hjkmnp
```

Output:

```
abcdefg

                   Whjkmnp
```

In this case `W` is positioned at 6+20 mm across and 8+5 mm down and `hjkmnp` is positioned next to `W`. Since there is no **POSITION** specified for **FIELD** for `attr3`, its starting point is the current position after `attr2` is printed.

If `attr2` has no value:

```
attr1 = abcdefg
attr2 =
attr3 = hjkmnp
```

Output:

```
abcdefg

       hjkmnp
```

In this case `hjkmnp` is positioned next to `abcdefg` but underneath, down 5 mm. Since there is no **POSITION** specified for **FIELD** for `attr3`, its starting point is the current position after `attr2` is printed. When there is no data for `attr2`, the `x` position does not change from where it ended with `attr1`, but the `y` position moves down 5 mm.

XML Data Element Example

An application can group XML data elements to be formatted together as an entity by grouping those elements hierarchically under a collection XML data element. The data order normally does not matter in formatting the data elements unless the elements are to be placed relative to each other in the inline direction. Any elements to be placed inline relative to each other must be ordered in inline presentation order. Use the **XLAYOUT**/**FIELD** commands to place the data on the presentation device. Figure 58 is an example of a bank customer showing the "name" and "address" fields placed together:

```
<Customer>
  <name>
    <title>Dr.</title>
    <first>Kelly</first>
    <last>Green</last>
  </name>
  <address>
    <strno>1911</strno>
    <street>Colt Lane</street>
    <city>Longmont</city>
    <state>CO</state>
    <zip>80501</zip>
  </address>
</Customer>
```

Figure 58. XML Data Elements

The example in Figure 58 results in the following printed output:

Dr. Kelly Green
1911 Colt Lane
Longmont, CO 80501

The page definition used to create the output is as follows:

```
PAGEDEF xmp101 UDTYPE ebcdic REPLACE yes;
/*-----------------------------------------------------*/
/* Font definitions:
/*-----------------------------------------------------*/
FONT E21H0C TYPE EBCDIC;

/*-----------------------------------------------------*/
/* Use QTAG definitions to define short alias names     */
/* that make coding the XLAYOUTs easier. Do the         */
/* messy work here, allowing us to code on the XLAYOUT: */
/*  XLAYOUT zip ...                                     */
/* instead of:                                          */
/*  XLAYOUT QTAG 'Customer','address','zip' ...         */
/*-----------------------------------------------------*/
Define cust   QTAG 'Customer'                 ;
Define title  QTAG 'Customer','name' ,'title';
```

```
Define first  QTAG 'Customer','name' ,'first';
Define last   QTAG 'Customer','name' ,'last' ;
Define strno  QTAG 'Customer','address' ,'strno' ;
Define street QTAG 'Customer','address' ,'street' ;
Define city QTAG 'Customer','address','city' ;
Define state  QTAG 'Customer','address' ,'state' ;
Define zip    QTAG 'Customer','address' ,'zip' ;

/*-------------------------------------------------------*/
/* Print first line "Dr. Kelly Green"                    */
/* NOTE:-The "collector" Customer starts a new page      */
/*  -RELATIVE 0 is not the same as SAME                  */
/*  -RELATIVE 0.167 is equivalent to a 6 CPI space       */
/*  along with FIELD TEXT, giving us 2 ways to           */
/*  leave a space.                                       */
/*  -Watch out for the POSITION defaults on XLAYOUT      */
/*  and FIELDs                                           */

/*-------------------------------------------------------*/
XLAYOUT cust           NEWPAGE;
XLAYOUT title  POSITION ABSOLUTE 1 in ABSOLUTE 1 in;
XLAYOUT first  POSITION RELATIVE 0 in RELATIVE 0;
 FIELD TEXT'';
 FIELD START 1 LENGTH *;
XLAYOUT last   POSITION RELATIVE 0.167 in RELATIVE 0;
/*-------------------------------------------------------*/
/* Print second line "1911 Colt Lane"                 */
/*-------------------------------------------------------*/
XLAYOUT strno POSITION ABSOLUTE 1 in NEXT;
XLAYOUT street POSITION RELATIVE 0 RELATIVE 0;
 FIELD TEXT'';
 FIELD START 1 LENGTH *;

/*-------------------------------------------------------*/
/* Print third line "Longmont, CO 80501"                 */
/*-------------------------------------------------------*/
XLAYOUT city  POSITION ABSOLUTE 1 in NEXT;
XLAYOUT state POSITION RELATIVE 0 RELATIVE 0;
 FIELD TEXT',';
 FIELD START 1 LENGTH 2;  /*just the abbreviation/*
XLAYOUT zip   POSITION RELATIVE 0 RELATIVE 0;
 FIELD TEXT'';
 FIELD START 1 LENGTH *;
```

In the above example, the XML data items “Dr.”, “Kelly”, and “Green” are printed relative to each other using *relative inline positioning*. This can only be done because the data appears in the following order: the title, “Dr.” is first; the first name, “Kelly” is next;, and the last name, “Green” is last. However, if you wanted to use this data, and change the order of the names to print the last name followed by the first name, you ***must*** position the names using *absolute inline positioning*, because the data cannot be reordered using *relative inline positioning*.

XML Data Format Example

XML allows the same data to be used for multiple presentation media. In Figure 59 XML data file is shown formatted for printing with PPFA's XML support.

```
<?xml version="1.0" ?>
<?xml:stylesheet type="text/xsl" href=bbbank.xsl"?>
<!--                                                -->
<!-- Data for XML Example                           -->
<!--                                                -->
<document>
<bankstatement>
 <customer>
  <acctno>026-257311</acctno>
  <name>Justin Case</name>
  <street>123 Redlight Lane</street>
  <cityst>Twistnshout, MA 02345</cityst>
 </customer>
 <begindate>JAN 02, 2002</begindate>
 <enddate>FEB 01, 2002</enddate>
<!--                                                -->
<!-- Page number generator                          -->
<!--                                                -->
 <pagenumber>
<!--                                                -->
<!-- New account type = Super Checking Account      -->
<!--                                                -->
 <supercheckingactivity type="superchk">
  <balance>
   <begin>2591.24</begin>
   <credit>1946.93</credit>
   <debit>1956.43</debit>
   <svchg>0.00</svchg>
   <end>0.00</end>
  </balance>
<!--                                                -->
<!-- Credit                                         -->
<!--                                                -->
  <credits>
   <transaction>
    <type>DEPOSIT</type>
    <date>01/05/2002</date>
    <amt> 26.90</amt>
   </transaction>
   <transaction>
    <type>AUTO DEPOSIT</type>
    <date>01/05/2002</date>
    <amt> 954.27</amt>
   </transaction>
   <transaction>
    <type>AUTO DEPOSIT</type>
    <date>01/30/2002</date>
    <amt> 954.27</amt>
   </transaction>
```

Figure 59. XML Data File (Part 1 of 5)

```
   <transaction>
    <type>INTEREST</type>
    <date>01/31/2002</date>
    <amt>  11.49</amt>
   </transaction>
   <total>
  </credits>
<!--                                                -->
<!-- Checks                                         -->
<!--                                                -->
  <checks>
   <transaction>
    <chkno>352</chkno>
    <date>01/04/2002</date>
    <amt> 321.50</amt>
   <transaction>
   <transaction>
    <chkno>353</chkno>
    <date>01/05/2002</date>
    <amt> 100.00</amt>
   <transaction>
   <transaction>
    <chkno>354</chkno>
    <date>01/10/2002</date>
    <amt> 122.30</amt>
   <transaction>
   <transaction>
    <chkno>355</chkno>
    <date>01/11/2002</date>
    <amt>  59.95</amt>
   <transaction>
   <transaction>
    <chkno>356</chkno>
    <date>01/15/2002</date>
    <amt> 852.33</amt>
   <transaction>
   <transaction>
    <chkno>357</chkno>
    <date>01/30/2002</date>
    <amt> 500.35</amt>
   <transaction>
  </checks>
<!--                                                -->
<!-- Daily Balances                                 -->
<!--                                                -->
  <balances>
   <baldata>
    <date>01/04/2002</date>
    <bal>2269.74</bal>
   </baldata>
   <baldata>
    <date>01/05/2002</date>
    <bal>2196.64</bal>
   </baldata>
   <baldata>
    <date>01/10/2002</date>
    <bal>2074.34</bal>
   </baldata>
   <baldata>
    <date>01/11/2002</date>
    <bal>2014.39</bal>
   </baldata>
```

Figure 59. XML Data File (Part 2 of 5)

```
   <baldata>
    <date>01/15/2002</date>
    <bal> 852.33</bal>
   </baldata>
   <baldata>
    <date>01/30/2002</date>
    <bal> 500.35</bal>
   </baldata>
   <total>2581.74</total>
  </balances>
<!--                                                -->
<!-- Statement trailer generator                    -->
<!--                                                -->
  <stmttrailer/>
 </superbankingactivity>
</bankstatement>
<bankstatement>
 <customer>
  <acctno>887-278342</acctno>
  <name>Anna Merkin</name>
  <street>123 Chantilly Lane</street>
  <cityst>Long Neck Goose, VA 21177</cityst>
</customer>
<begindate>JAN 02, 2002</begindate>
<enddate>FEB 01, 2002</enddate>
<!--                                                -->
<!-- Page number generator                          -->
<!--                                                -->
 <pagenumber>
<!--                                                -->
<!-- New account type = Super Checking Account      -->
<!--                                                -->
 <supercheckingactivity="suprchk">
  <balance>
   <begin>3722.23</begin>
   <credit>2084.58</credit>
   <debit>1908.94</debit>
   <svchg>0.00</svchg>
   <end>3897.87</end>
  </balance>
<!--                                                -->
<!-- Credits                                        -->
<!--                                                -->
  <credits>
   <transaction>
    <type>DEPOSIT</type>
    <date>01/11/2002</date>
    <amt>  17.37</amt>
   </transaction>
   <transaction>
    <type>AUTO DEPOSIT</type>
    <date>01/15/2002</date>
    <amt>1029.81</amt>
   </transaction>
   <transaction>
    <type>AUTO DEPOSIT</type>
    <date>01/30/2002</date>
    <amt>1029.81</amt>
   </transaction>
```

Figure 59. XML Data File (Part 3 of 5)

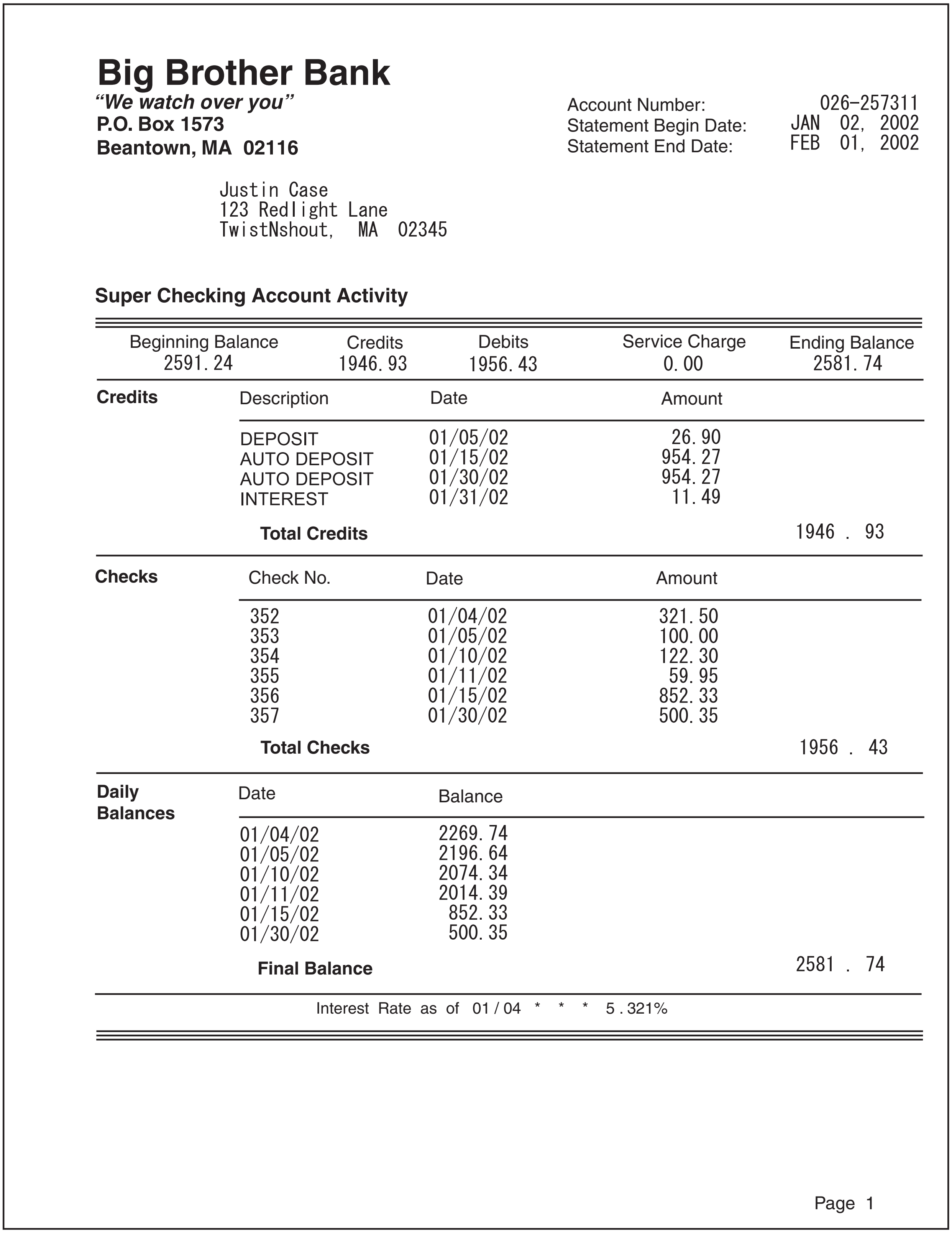
```
   <transaction>
    <type>INTEREST</type>
    <date>01/31/2002</date>
    <amt>   7.59</amt>
   </transaction>
   <total>2084.58</total>
  </credits>
<!--                                                -->
<!-- Checks                                         -->
<!--                                                -->
  <checks>
   <transaction>
    <chkno>759</chkno>
    <date>01/03/2002</date>
    <amt> 144.00</amt>
   </transaction>
   <transaction>
    <chkno>760</chkno>
    <date>01/04/2002</date>
    <amt>  93.11</amt>
   </transaction>
   <transaction>
    <chkno>761</chkno>
    <date>01/09/2002</date>
    <amt> 322.72</amt>
   </transaction>
   <transaction>
    <chkno>762</chkno>
    <date>01/11/2002</date>
    <amt> 102.43</amt>
   </transaction>
   <transaction>
    <chkno>763</chkno>
    <date>01/17/2002</date>
    <amt> 794.46</amt>
   </transaction>
   <transaction>
    <chkno>764</chkno>
    <date>01/29/2002</date>
    <amt> 452.22</amt>
   </transaction>
  </checks>
```

Figure 59. XML Data File (Part 4 of 5)

```
<!--                                                -->
<!-- Daily Balances                                 -->
<!--                                                -->
  <balances>
   <baldata>
    <date>01/04/2002</date>
    <bal>3722.23</bal>
   </baldata>
   <baldata>
    <date>01/05/2002</date>
    <bal>3629.12</bal>
   </baldata>
   <baldata>
    <date>01/10/2002</date>
    <bal>3306.40</bal>
   </baldata>
   <baldata>
    <date>01/11/2002</date>
    <bal>3221.34</bal>
   </baldata>
   <baldata>
    <date>01/15/2002</date>
    <bal>4251.15</bal>
   </baldata>
   <baldata>
    <date>01/30/2002</date>
    <bal>3897.87</bal>
   </baldata>
   <total>3897.87</total>
  </balances>
<!--                                                -->
<!-- Statement trailer generator                    -->
<!--                                                -->
  <stmttrailer>
 </supercheckingactivity>
</bankstatement>
</document>
```

Figure 59. XML Data File (Part 5 of 5)

Figure 60 on page 104 shows the resulting printed output from the XML data in Figure 59 on page 99.



Big Brother Bank
"We watch over you"
P.O. Box 1573
Beantown, MA 02116

Account Number: 026-257311
Statement Begin Date: JAN 02, 2002
Statement End Date: FEB 01, 2002

Justin Case
123 Redlight Lane
TwistNshout, MA 02345

Super Checking Account Activity

Beginning Balance	Credits	Debits	Service Charge	Ending Balance
2591.24	1946.93	1956.43	0.00	2581.74

Credits

Description	Date	Amount
DEPOSIT	01/05/02	26.90
AUTO DEPOSIT	01/15/02	954.27
AUTO DEPOSIT	01/30/02	954.27
INTEREST	01/31/02	11.49

Total Credits 1946 . 93

Checks

Check No.	Date	Amount
352	01/04/02	321.50
353	01/05/02	100.00
354	01/10/02	122.30
355	01/11/02	59.95
356	01/15/02	852.33
357	01/30/02	500.35

Total Checks 1956 . 43

Daily Balances

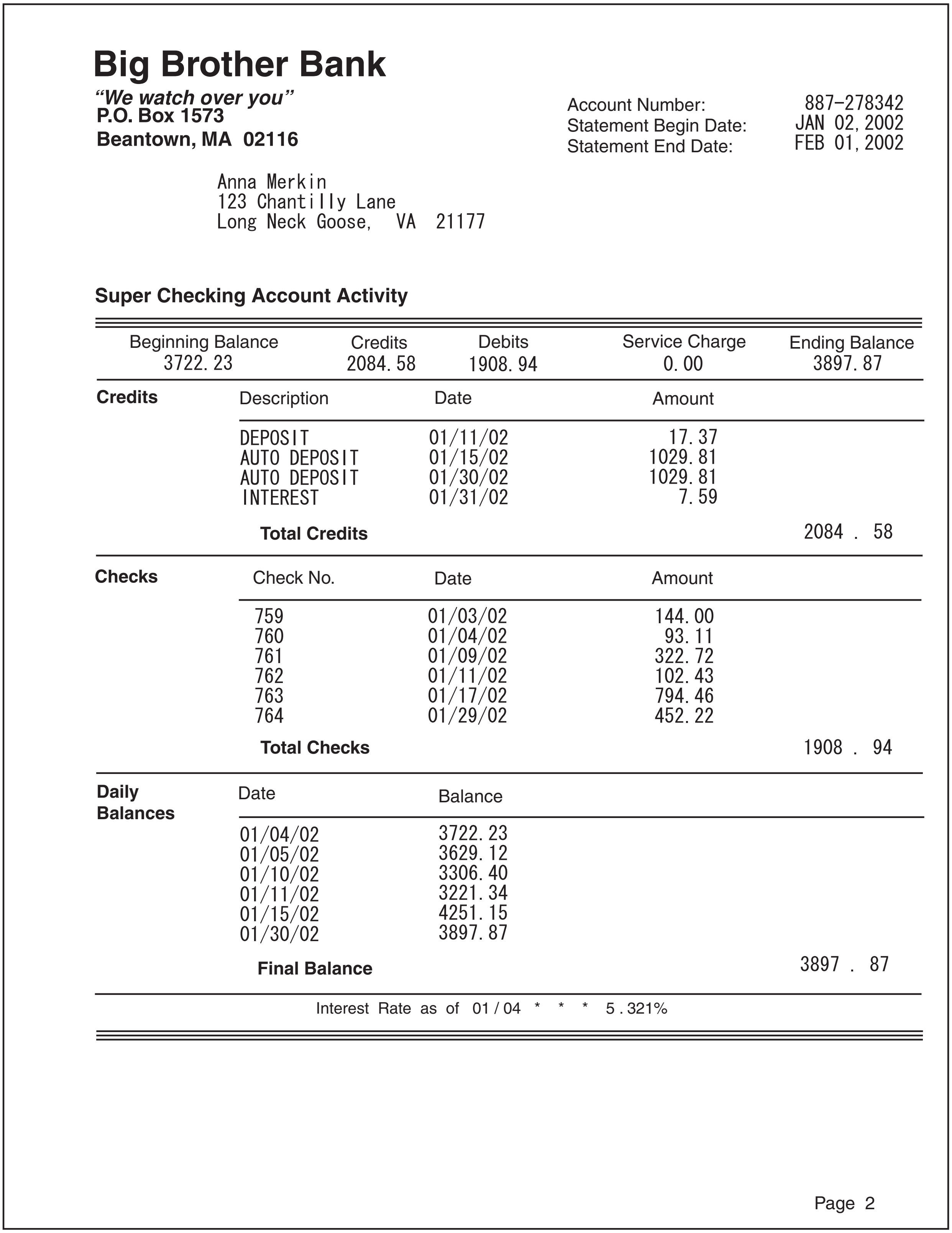
Date	Balance
01/04/02	2269.74
01/05/02	2196.64
01/10/02	2074.34
01/11/02	2014.39
01/15/02	852.33
01/30/02	500.35

Final Balance 2581 . 74

Interest Rate as of 01 / 04 * * * 5 . 321%

Page 1

Figure 60. XML Data Printed Output (Part 1 of 2)



Big Brother Bank

“We watch over you”
P.O. Box 1573
Beantown, MA 02116

Account Number:	887-278342
Statement Begin Date:	JAN 02, 2002
Statement End Date:	FEB 01, 2002

Anna Merkin
123 Chantilly Lane
Long Neck Goose, VA 21177

Super Checking Account Activity

Beginning Balance	Credits	Debits	Service Charge	Ending Balance
3722.23	2084.58	1908.94	0.00	3897.87

Credits

Description	Date	Amount
DEPOSIT	01/11/02	17.37
AUTO DEPOSIT	01/15/02	1029.81
AUTO DEPOSIT	01/30/02	1029.81
INTEREST	01/31/02	7.59

Total Credits 2084 . 58

Checks

Check No.	Date	Amount
759	01/03/02	144.00
760	01/04/02	93.11
761	01/09/02	322.72
762	01/11/02	102.43
763	01/17/02	794.46
764	01/29/02	452.22

Total Checks 1908 . 94

Daily Balances

Date	Balance
01/04/02	3722.23
01/05/02	3629.12
01/10/02	3306.40
01/11/02	3221.34
01/15/02	4251.15
01/30/02	3897.87

Final Balance 3897 . 87

Interest Rate as of 01 / 04 * * * 5 . 321%

Page 2

Figure 60. XML Data Printed Output (Part 2 of 2)

The page definition used to create the output in Figure 60 on page 104 is shown in Figure 61 on page 106:

```
PAGEDEF bbbank replace yes
        WIDTH 8.5 in
        HEIGHT 11.0 in
        UDTYPE EBCDIC;
  FONT  comp  a075nc  TYPE EBCDIC;/*Big Brother Bank font  */
  FONT  ital  a175dc  TYPE EBCDIC;/*Italic theme           */
  FONT  addr  a075dc  TYPE EBCDIC;/*Big Brother address    */
  FONT  varb  gt10    TYPE EBCDIC;/*Variable data          */
  FONT  super a075dc  TYPE EBCDIC;/*Super Checking Account */
  FONT  head   a055ac TYPE EBCDIC;/*Headings               */
  FONT  bhead  a075ac TYPE EBCDIC;/*Bold Headings          */
 /************************************************/
 /** QTAG declarations                          **/
 /************************************************/
 /*---- statmid declarations --------------------*/
  DEFINE statmid   QTAG C'document',
                        C'bankstatement',C'customer';
  DEFINE acctno    QTAG C'document',
                        C'bankstatement',C'customer',C'acctno';
  DEFINE name      QTAG C'document',
                        C'bankstatement',C'customer',C'name';
  DEFINE street    QTAG C'document',
                        C'bankstatement',C'customer',C'street';
  DEFINE cityst    QTAG C'document',
                        C'bankstatement',C'customer',C'cityst';
  DEFINE begindate QTAG C'document',
                        C'bankstatement',C'begindate';
  DEFINE enddate   QTAG C'document',
                        C'bankstatement',C'enddate';
 /*---- statsum declarations --------------------*/
  DEFINE statsum   QTAG C'document',
                        C'bankstatement',C'supercheckingactivity'
                        C'balance'    ;
  DEFINE statsumf1 QTAG C'document',
                        C'bankstatement',C'supercheckingactivity'
                        C'balance', c'begin';
  DEFINE statsumf2 QTAG C'document',
                        C'bankstatement',C'supercheckingactivity'
                        C'balance', c'credit';
  DEFINE statsumf3 QTAG C'document',
                        C'bankstatement',C'supercheckingactivity'
                        C'balance', c'debit';
  DEFINE statsumf4 QTAG C'document',
                        C'bankstatement',C'supercheckingactivity'
                        C'balance', c'svchg';
  DEFINE statsumf5 QTAG C'document',
                        C'bankstatement',C'supercheckingactivity'
                        C'balance', c'end';
 /*---- crdata  declarations --------------------*/
  DEFINE crheader  QTAG C'document',
                        C'bankstatement',C'supercheckingactivity',
                        C'credits';
  DEFINE crdata1   QTAG C'document',
                        C'bankstatement',C'supercheckingactivity',
                        C'credits',C'transaction',C'type' ;
  DEFINE crdata2   QTAG C'document',
                        C'bankstatement',C'supercheckingactivity',
                        C'credits',C'transaction',C'date' ;
```

Figure 61. Page Definition for XML Output (Part 1 of 7)

```
 DEFINE crdata3   QTAG C'document',
                       C'bankstatement',C'supercheckingactivity',
                       C'credits',C'transaction',C'amt'  ;
 DEFINE crtotal   QTAG C'document',
                       C'bankstatement',C'supercheckingactivity',
                       C'credits',C'total';
/*---- ckdata  declarations --------------------*/
 DEFINE ckheader  QTAG C'document',
                       C'bankstatement',C'supercheckingactivity',
                       C'checks' ;
 DEFINE ckdata1   QTAG C'document',
                       C'bankstatement',C'supercheckingactivity',
                       C'checks',C'transaction',C'chkno' ;
 DEFINE ckdata2   QTAG C'document',
                       C'bankstatement',C'supercheckingactivity',
                       C'checks',C'transaction',C'date' ;
 DEFINE ckdata3   QTAG C'document',
                       C'bankstatement',C'supercheckingactivity',
                       C'checks',C'transaction',C'amt' ;
 DEFINE cktotal   QTAG C'document',
                       C'bankstatement',C'supercheckingactivity',
                       C'checks', C'total';
/*---- baldata declarations ---------------------*/
 DEFINE balhead   QTAG C'document',
                       C'bankstatement',C'supercheckingactivity',
                       C'balances';
 DEFINE baldata1  QTAG C'document',
                       C'bankstatement',C'supercheckingactivity',
                       C'balances',C'baldata',C'date' ;
 DEFINE baldata2  QTAG C'document',
                       C'bankstatement',C'supercheckingactivity',
                       C'balances',C'baldata',C'bal' ;
 DEFINE baltotal  QTAG C'document',
                       C'bankstatement',C'supercheckingactivity',
                       C'balances', C'total';
/*---- misc.   declarations --------------------*/
 DEFINE statrail  QTAG C'document',
                       C'bankstatement',C'supercheckingactivity',
                       C'stmttrailer';
 DEFINE pgenum    QTAG C'document',
                       C'bankstatement',C'pagenumber';
/*----------------------------------------------*/
/*---- end of QTAG declarations ----------------*/
/*----------------------------------------------*/
 PAGEFORMAT xchub1   TOPMARGIN 2 in BOTMARGIN  1 in;
/***********************************************/
/** statmid  HEADER                          **/
/***********************************************/
XLAYOUT statmid   PAGEHEADER NEWPAGE
        POSITION .6 in ABSOLUTE .55 in;
   FIELD  TEXT C'Big Brother Bank'  ALIGN LEFT
                 FONT comp ;   /* default to LAYOUT positioning */
   FIELD  TEXT C'"We watch over you"' ALIGN LEFT
                 POSITION   0 NEXT
                 FONT ital ; /*default to next line          */
   FIELD  TEXT C'P.O. Box 1573' ALIGN LEFT
                 POSITION   0 NEXT
                 FONT addr ; /*default to next line          */
```

Figure 61. Page Definition for XML Output (Part 2 of 7)

```
FIELD  TEXT C'Beantown, MA  02116' ALIGN LEFT
                    POSITION   0 NEXT
                    FONT addr ; /*default to next line          */
    FIELD  TEXT C'Account Number:' ALIGN LEFT
                    POSITION  4.3 in .2 in
                    FONT head ; /*New area on right             */
    FIELD  TEXT C'Statement Begin Date:' ALIGN LEFT
                    POSITION  4.3 in  NEXT
                    FONT head ; /*New area on right             */
    FIELD  TEXT C'Statement End Date:' ALIGN LEFT
                    POSITION  4.3 in  NEXT
                    FONT head ; /*New area on right             */
 XLAYOUT acctno    PAGEHEADER CONTINUE
   POSITION SAME SAME;
    FIELD  START  1 LENGTH 10          ALIGN RIGHT
                    POSITION  7.5 in .2 in
                    FONT varb ;
 XLAYOUT begindate PAGEHEADER CONTINUE
   POSITION SAME SAME;
    FIELD  START 1 LENGTH 12
                    POSITION  7.5 in .37 in
                    ALIGN RIGHT
                    FONT varb ;
 XLAYOUT enddate   PAGEHEADER CONTINUE
   POSITION SAME SAME;
    FIELD  START 1 LENGTH 12
                    POSITION  7.5 in .53 in
                    ALIGN RIGHT
                    FONT varb ;
 XLAYOUT name      PAGEHEADER CONTINUE
   POSITION SAME SAME;
    FIELD  START 1 LENGTH 19          ALIGN LEFT
                    POSITION  1.1 in  .9 in
                    FONT varb ;
 XLAYOUT street    PAGEHEADER CONTINUE
   POSITION SAME SAME;
    FIELD  START 1 LENGTH 19          ALIGN LEFT
                    POSITION  1.1 in  1.07 in
                    FONT varb ;
 XLAYOUT cityst    PAGEHEADER CONTINUE
   POSITION SAME SAME;
    FIELD  START 1 LENGTH 22          ALIGN LEFT
                    POSITION  1.1 in  1.23 in
                    FONT varb ;
 /************************************************/
 /** statsum  BODY                              **/
 /************************************************/
 XLAYOUT   statsum  BODY
                    POSITION .6 in .5 in;
    FIELD  TEXT C'Super Checking Account Activity'
                    FONT super ; /* Static text - Super Checking */
    DRAWGRAPHIC LINE  ACROSS 7.5 IN LINEWT BOLD
         POSITION  0  .15 in
         copy   down 2 spaced 1 mm;
    FIELD  TEXT C'Beginning Balance'
                    POSITION  .3 in .4 in
                    FONT head  ; /* Static text - first header   */
    FIELD  TEXT C'Credits'
                    POSITION 2.4 in CURRENT
                    FONT head  ; /* Static text - first header   */
```

Figure 61. Page Definition for XML Output (Part 3 of 7)

```
   FIELD  TEXT C'Debits'
                   POSITION 3.6 in CURRENT
                   FONT head  ; /* Static text - first header   */
   FIELD  TEXT C'Service Charge'
                   POSITION 4.8 in CURRENT
                   FONT head  ; /* Static text - first header   */
   FIELD  TEXT C'Ending Balance'
                   POSITION 6.3 in CURRENT
                   FONT head  ; /* Static text - first header   */
  XLAYOUT statsumf1 BODY
                   POSITION SAME .6 in;
   FIELD  START  1  LENGTH  8
                   POSITION  .6 in CURRENT
                   FONT varb  ; /* Variable text - Beg balance  */
 XLAYOUT statsumf2 BODY
                   POSITION SAME SAME;
   FIELD  START 1   LENGTH  8
                   POSITION 2.2 in CURRENT
                   FONT varb  ; /* Variable text - Credits      */
  XLAYOUT statsumf3 BODY
                   POSITION SAME SAME;
   FIELD  START 1   LENGTH  8
                   POSITION 3.4 in CURRENT
                   FONT varb  ; /* Variable text - Debits       */
  XLAYOUT statsumf4 BODY
                   POSITION SAME SAME;
   FIELD  START 1   LENGTH  5
                   POSITION 5.0 in CURRENT
                   FONT varb  ; /* Variable text - Service Chrg */
  XLAYOUT statsumf5 BODY
                   POSITION SAME SAME;
   FIELD  START 1   LENGTH  8
                   POSITION 6.5 in CURRENT
                   FONT varb  ; /* Variable text - End Balance  */
   DRAWGRAPHIC LINE  ACROSS 7.5 IN LINEWT BOLD
            POSITION  0 .1 in;
/************************************************/
/** crheader GROUPHEADER                       **/
/************************************************/
XLAYOUT   crheader   GRPHEADER XSPACE .2 in
                  POSITION  SAME .3 in;
   FIELD  TEXT C'Credits'
                   FONT bhead  ; /* Static text - Credits        */
   FIELD  TEXT C'Description'
                   POSITION  1.3 in   CURRENT
                   FONT  head  ; /* Stat text - Deposit Descr. */
   FIELD  TEXT C'Date'
                   POSITION  3.2 in   CURRENT
                   FONT  head  ; /* Static text - Date           */
   FIELD  TEXT C'Amount'
                   POSITION  5.0 in   CURRENT
                   FONT  head  ; /* Stat text - Amount of deposit*/
   DRAWGRAPHIC LINE  ACROSS 6.2 IN LINEWT BOLD
                   POSITION 1.3 in next;
/************************************************/
/** crdata   BODY                              **/
/************************************************/
XLAYOUT   crdata1  BODY  GROUP;
   FIELD  START  1 LENGTH 13
                   POSITION  1.3 in  CURRENT
                   FONT  varb  ; /* Variable text - Description  */
```

Figure 61. Page Definition for XML Output (Part 4 of 7)

```
 XLAYOUT   crdata2  BODY  GROUP   position same same;
    FIELD  START  1 LENGTH 8
                    POSITION  3 in  CURRENT
                    FONT  varb  ; /* Variable text - Date         */
XLAYOUT   crdata3  BODY  GROUP   position same same;
    FIELD  START  1 LENGTH 8     ALIGN RIGHT
                    POSITION  5.6 in  CURRENT
                    FONT  varb  ; /* Variable text - Amount       */
 /************************************************/
 /** crtotal  BODY                              **/
 /************************************************/
 XLAYOUT   crtotal  BODY  GROUP;
    FIELD  TEXT C'Total Credits'
                    POSITION  1.5 in   .2 in
                    FONT bhead  ; /* Stat text - Total credits    */
    FIELD  START 1 LENGTH 8   ALIGN RIGHT
                    POSITION  7.3 in  CURRENT
                    FONT  varb  ; /* Variable text - Amount       */
    DRAWGRAPHIC LINE  ACROSS 7.5 IN LINEWT BOLD
                    POSITION   0  next;
 /************************************************/
 /**  ckheader  GROUPHEADER                     **/
 /************************************************/
 XLAYOUT   ckheader   GRPHEADER XSPACE .2 IN
                    POSITION   SAME .6 in;
    FIELD  TEXT C'Checks'
                    FONT bhead  ; /* Static text - Checks         */
    FIELD  TEXT C'Check No.'
                    POSITION  1.3 in   CURRENT
                    FONT  head  ; /* Stat text - Check number     */
    FIELD  TEXT C'Date'
                    POSITION  3.2 in   CURRENT
                    FONT  head  ; /* Stat text - Date of check    */
    FIELD  TEXT C'Amount'
                    POSITION  5.0 in   CURRENT
                    FONT  head  ; /* Static text - Amount of check*/
    DRAWGRAPHIC LINE  ACROSS 6.2 IN LINEWT BOLD
                    POSITION 1.3 in next;
 /************************************************/
 /**  ckdata  BODY                              **/
 /************************************************/
 XLAYOUT   ckdata1  BODY  GROUP
                    POSITION SAME NEXT;
    FIELD  START  1 LENGTH 3
                    POSITION 1.5 in  CURRENT
                    FONT  varb  ; /* Variable text - Check number */
 XLAYOUT   ckdata2  BODY  GROUP   position same same;
    FIELD  START  1 LENGTH 8
                    POSITION  3.0 in  CURRENT
                    FONT  varb  ; /* Variable text - Date         */
 XLAYOUT   ckdata3  BODY  GROUP   position same same;
    FIELD  START  1 LENGTH 8  ALIGN RIGHT
                    POSITION  5.6 in   CURRENT
                    FONT  varb  ; /* Variable text - Amount       */
 /************************************************/
 /** cktotal  BODY                              **/
 /************************************************/
 XLAYOUT   cktotal  BODY  GROUP;
    FIELD  TEXT C'Total Checks'
                    POSITION  1.5 in   .2 in
                    FONT bhead  ; /* Stat text - Total checks     */
```

Figure 61. Page Definition for XML Output (Part 5 of 7)

```
   FIELD  START 1 LENGTH 8  ALIGN RIGHT
                POSITION  7.3 in  CURRENT
                FONT  varb  ; /* Variable text - Amount       */
   DRAWGRAPHIC LINE  ACROSS 7.5 IN LINEWT BOLD
                POSITION   0   next;
/************************************************/
/** balhead  GROUPHEADER                      **/
/************************************************/
XLAYOUT   balhead   GRPHEADER XSPACE .2 in
                POSITION  SAME .6 in;
   FIELD  TEXT C'Daily'
                FONT bhead  ; /* Static text - Daily Balance  */
   FIELD  TEXT C'Date'
                POSITION  1.3 in   CURRENT
                FONT  head  ; /* Stat text - Date of balance  */
   FIELD  TEXT C'Balance'
                POSITION 3.15 in   CURRENT
                FONT  head  ; /* Static text - Balance        */
   FIELD  TEXT C'Balances'
                POSITION  0  NEXT
                FONT bhead  ; /* Static text - Daily Balance  */
   DRAWGRAPHIC LINE  ACROSS 6.2 IN LINEWT BOLD
                POSITION 1.3 in CPOS;
/************************************************/
/** baldata  BODY                             **/
/************************************************/
XLAYOUT   baldata1  BODY  GROUP
                POSITION SAME  NEXT;
   FIELD  START 01 LENGTH 8
                POSITION 1.3 in  CURRENT
                FONT  varb  ; /* Variable text - Date         */
XLAYOUT   baldata2  BODY  GROUP  position same same;
   FIELD  START 01 LENGTH 8    ALIGN RIGHT
                POSITION  3.8 in  CURRENT
                FONT  varb  ; /* Variable text - Amount       */
/************************************************/
/** baltotal BODY                             **/
/************************************************/
XLAYOUT   baltotal  BODY  GROUP;
   FIELD  TEXT C'Final Balance'
                POSITION  1.5 in   .2 in
                FONT bhead  ; /* Stat text - Final balance    */
   FIELD  START 1 LENGTH 8    ALIGN RIGHT
                POSITION  7.3 IN CURRENT
                FONT  varb  ; /* Variable text - Amount       */
/************************************************/
/** statrail BODY                             **/
/************************************************/
XLAYOUT   statrail  BODY
            POSITION SAME .4 in;
   DRAWGRAPHIC LINE  ACROSS 7.5 IN LINEWT BOLD
            POSITION 0 CPOS;
   FIELD  TEXT C'Interest Rate '
        POSITION  2.0 in NEXT
                FONT bhead ; /* Static text - Interest rate  */
   FIELD  TEXT C'As of 01/04  * * *  5.321%'
        POSITION  CURRENT CURRENT
                FONT varb ;  /* Static text                  */
   DRAWGRAPHIC LINE  ACROSS 7.5 IN LINEWT BOLD
          POSITION 0  NEXT
        copy   down 2 spaced 1 mm;
```

Figure 61. Page Definition for XML Output (Part 6 of 7)

```
/***********************************************/
/** pgenum   PAGE NUMBER                      **/
/***********************************************/
XLAYOUT   pgenum  PAGETRAILER
               POSITION SAME ABSOLUTE 10.7 in;
   FIELD  TEXT C 'Page '
          POSITION 6.5 in CURRENT
          FONT  varb;           /* placement of page number     */
   FIELD  PAGENUM PRINT         /* request page numbering       */
          FONT  varb            /* placement of page number     */
          POSITION CURRENT CURRENT;
```

Figure 61. Page Definition for XML Output (Part 7 of 7)

Chapter 5. Creating Complex Printouts

You are now ready to learn about some formatting tasks that might apply to more complex printouts. The basic form definition and page definition elements have been covered. This chapter describes how these elements are combined to create complete print jobs.

The advanced techniques covered in this section are illustrated in the following examples:

Table 5. Form Definitions and Page Definition Tasks

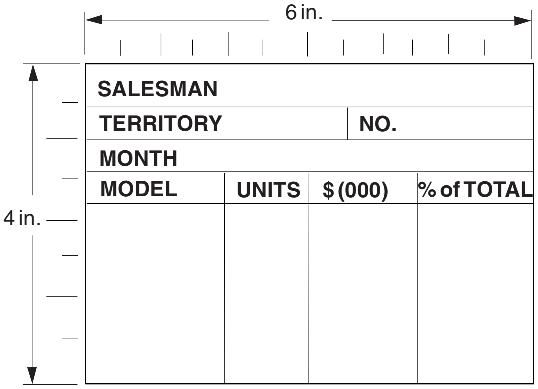
Tasks	**Example location**
Field Processing with Overlay	"Combining Field Processing and an Electronic Overlay"
Suppressing Data	"Using Suppressions to Vary Data Presentation" on page 115
Including Fixed Text	"Incorporating Fixed Text into a Page Definition" on page 116
Combining Two Reports	"Combining Two Reports into One Printout" on page 120

The examples in this chapter build on a single sales application, showing different sales reports being formatted by form definitions and page definitions.

Combining Field Processing and an Electronic Overlay

This example involves printing a monthly individual sales report for a specified distribution. The following items are needed to generate the sales report:
- A pre-designed electronic overlay for the sales report
- An unformatted print data file with periodic sales statistics

An example of these is shown in Figure 62 on page 114.



Overlay

	1	2	3	4	5	6	7	8	9		1	2	3	4	5	6	7	8	9		1	2	3
R1	J	o	h	n		S	m	i	t	h													
R2	T	e	x	a	s					0	7	7	1	4									
R3	N	o	v	.																			
R4	S	i	e	r	r	a					1	2					5	9					6
R6	O	t	e	r	o						1	6					7	0				1	0
R6	A	g	u	a							6	0				1	0	4				1	5
R7	A	l	l	e	g	r	e				7	1				2	6	5				4	0

Data File

Figure 62. Electronic Overlay and Data File for a Sales Report

The code example that follows contains a form definition and a page definition. The page definition maps the file to the overlay.

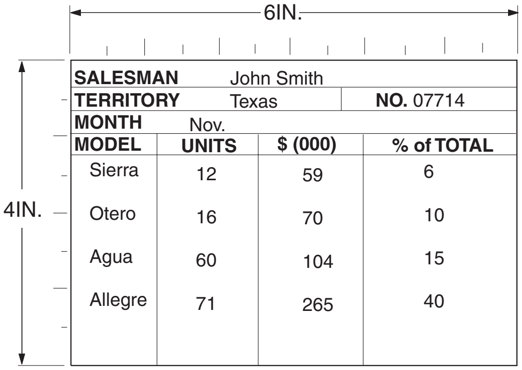
In Figure 62 the 0,0 point is the upper-left corner of the overlay. This means that the logical page origin must coincide with the overlay origin in this example. **POSITION** subcommands are relative to the logical page origin. The overlay origin point that positions the overlay is specified in the Overlay Generation Language/370 that creates the overlay, but can be modified in the page definition. In mapping to an overlay, you should check the input to the overlay creation program so you can coordinate its origin with the logical page origin. You can reposition the overlay through the **PRINTLINE** command.

```
FORMDEF SLSRPT OFFSET 0 0 ;
  OVERLAY SLSRPT ;
    SUBGROUP OVERLAY SLSRPT ;

PAGEDEF SLSRPT ;
  PRINTLINE  POSITION 2 IN 1.3 IN ;   /* RECORD 1           */
   FIELD START 1 LENGTH 23  ;
  PRINTLINE  POSITION 2 IN 1.70 IN ;  /* RECORD 2           */
    FIELD START 1 LENGTH 9 ;         /* DEFAULT POSITION    */
    FIELD START 10 LENGTH 5
          POSITION 4.3 IN  * ;       /* THE ASTERISK MEANS  */
                                     /* CURRENT LINE        */
  PRINTLINE POSITION 1.5 IN 6 IN ;   /* RECORD 3            */
    FIELD START 1 LENGTH 4 ;
 SETUNITS LINESP 4 LPI ;
  PRINTLINE  REPEAT 4                /* RECORDS 4-7         */
            POSITION 1.5 IN  3.6 IN ;
  FIELD START 1 LENGTH 7 ;           /* DEFAULT POSITION    */
  FIELD START 10 LENGTH 3
```

```
20        POSITION 1.5 IN * ;
21   FIELD START 16 LENGTH 3
22        POSITION 2.5 IN * ;
23   FIELD START 21 LENGTH 3
24        POSITION 3.5 IN * ;
```

A time-saving device used in the above example is the **REPEAT** subcommand (line 16), which maps a single printline with its field subsets to records 4 through 7 with all model names and sales statistics. The length values in the repeated fields are 7, 3, 3, and 3—sufficient to accommodate the largest model name, unit value, $(000), and percentage fields mapped by this **FIELD** command.

Figure 63 shows the report formatted by the resources generated in the command stream of this example.



SALESMAN	John Smith		
TERRITORY	Texas		**NO.** 07714
MONTH	Nov.		
MODEL	**UNITS**	**$ (000)**	**% of TOTAL**
Sierra	12	59	6
Otero	16	70	10
Agua	60	104	15
Allegre	71	265	40

Figure 63. Sales Report

Using Suppressions to Vary Data Presentation

PPFA and your print server printers enable you to produce variations of the same report in a single job. The essential function for this capability is called *suppression*. Suppression involves the coordinated specification of elements in both the page definition and the form definition. You create a suppression in the page definition and turn it on or off in a subgroup within a form definition.

This example shows how to alter the controls in the previous example (“Combining Field Processing and an Electronic Overlay” on page 113) in order to generate a second report along with the one already created.

First, change the page definition by adding a **SUPPRESSION** subcommand to the third field in the repeated **PRINTLINE—**the **PRINTLINE** that mapped the models and sales figures in “Combining Field Processing and an Electronic Overlay” on page 113. The suppression is, in effect, created by the **SUPPRESSION** subcommand in the **FIELD** command. The following example shows the addition at line 23.

```
18   FIELD START 1 LENGTH 7 ;
19   FIELD START 10 LENGTH 3
20        POSITION 1.5 IN * ;
21   FIELD START 16 LENGTH 3
22        POSITION 2.5 IN  *
23        SUPPRESSION SALES ;       /*ADDED LINE     */
24   FIELD START 21 LENGTH 3
25        POSITION 3.5 IN * ;
```

The **SUPPRESSION** subcommand creates the potential for selective suppression of the data in the “$(000)” field of the report.

Then, rewrite the form definition, creating two subgroups within the copy group. Next, write a **SUPPRESSION** command immediately after the **FORMDEF** command. Finally, place a **SUPPRESSION** subcommand in the subgroup in which you want the data suppressed. This names the suppression. The resulting form definition command stream is as follows:

```
FORMDEF SECRPT ;
  SUPPRESSION SALES ;            /*NAMING THE SUPPRESSION      */
  COPYGROUP SECRPT ;
    OVERLAY SLSRPT ;             /*NAMING THE OVERLAY          */
    SUBGROUP COPIES 1
             OVERLAY SLSRPT  ;
    SUBGROUP COPIES 1
             OVERLAY SLSRPT
             SUPPRESSION SALES ;  /*TURNING ON THE SUPPRESSION  */
```

The result is shown in Figure 64. The second subgroup creates the second output page of the same data with a second set of modifications; in this case, *modifications* means a suppression that is not in the first subgroup.

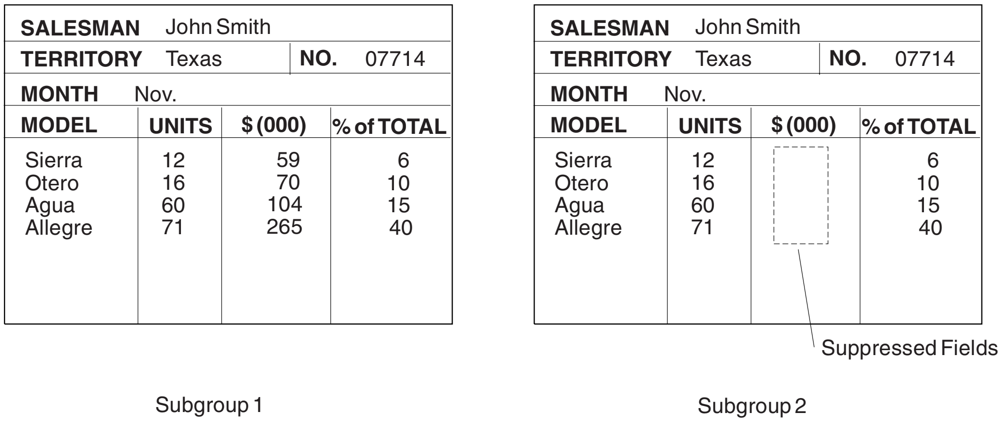


Figure 64. Selective Suppression

Review the steps in this example. To suppress a field, identify the field as *suppressible* in the page definition under the **FIELD** command in question. Then create a subgroup, activating this suppression with a **SUPPRESSION** subcommand in the form definition.

The first subgroup produces an output identical to the report in “Combining Field Processing and an Electronic Overlay” on page 113. It contains no suppression.

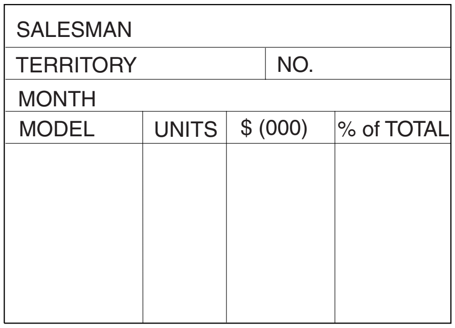
Note: This example can only be printed simplex.

Incorporating Fixed Text into a Page Definition

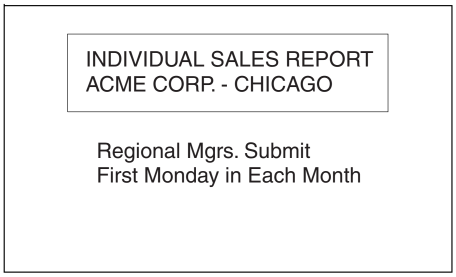
Fixed text can be incorporated into an electronic overlay through the use of programs, such as Overlay Generation Language/370. Having another place (the page definition) to incorporate fixed text permits you to format documents more efficiently.

In “Combining Field Processing and an Electronic Overlay” on page 113, a territory sales report for salesman John Smith is created. Here, the territory sales report is incorporated into a larger format going to ACME's corporate headquarters in Chicago. Therefore, the identification for the region needs to appear on the report form. An overlay is used as a header for the composite report. This means that two overlays appear in the command stream: one carries over from “Combining Field Processing and an Electronic Overlay” on page 113 and the other is the header.

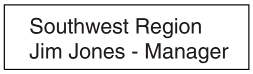
So, as shown in Figure 65, three fixed inputs generate the final report: overlay SLSRPT, overlay HDR, and the fixed regional identification text. (It is the second item that is worked into the page definition in this example.)



Overlay SLSRPT



Overlay HDR



Fixed Text

Figure 65. Input for the Corporate Version of an Individual Sales Report

The data file used to generate this report is the same as the one shown in Figure 62 on page 114.

```
FORMDEF CORP ;
  OVERLAY SLSRPT ;
  OVERLAY HDR ;
  SUBGROUP OVERLAY SLSRPT HDR ;
PAGEDEF CORP
        WIDTH 6 IN
        HEIGHT 7 IN ;
 PRINTLINE POSITION 1.9 IN 2.5 IN ;         /*RECORD 1             */
  FIELD TEXT C 'SOUTHWEST REGION' ;         /*DEFAULT FIELD TEXT   */
                                            /*POSITION             */
  FIELD POSITION -.2 IN NEXT                /*NOTE NEGATIVE VALUE  */
        TEXT 1 C 'JIM JONES - MANAGER' ;
  FIELD START 1 LENGTH 23
        POSITION .1 IN .8 IN ;
 PRINTLINE POSITION 2 IN 3.7 IN ;           /*RECORD 2             */
```

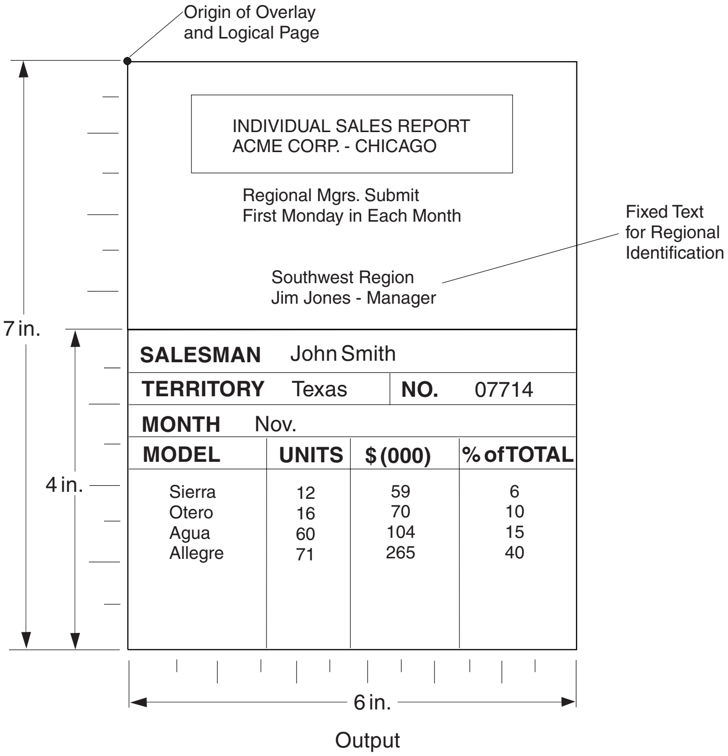
```
  FIELD START 1 LENGTH 9 ;                /*DEFAULT FIELD        */
                                          /*POSITION             */
  FIELD START 10 LENGTH 5
        POSITION 2.5  IN *  ;
 PRINTLINE POSITION 1.5 IN  4 IN ;        /*RECORD 3             */
  FIELD START 1 LENGTH 4 ;
SETUNITS LINESP 4 LPI ;
 PRINTLINE REPEAT 4                       /*RECORDS 4-7          */
           POSITION .4 IN  4.7 IN ;
  FIELD START 1 LENGTH 7 ;                /*DEFAULT FIELD        */
                                          /*POSITION             */
  FIELD START 10 LENGTH 3
        POSITION 1.6 IN * ;
  FIELD START 16 LENGTH 3
        POSITION 2.9 IN * ;
  FIELD START 21 LENGTH 3
        POSITION 4.3 IN * ;
```

In the above command stream, the same basic commands from "Combining Field Processing and an Electronic Overlay" on page 113 are used, although the positions of fields have been changed to accommodate the new layout.

New **FIELD** commands with **TEXT** subcommands have been inserted in the first **PRINTLINE** command to produce the regional text, which is positioned at the bottom of the header form. The 1 is a duplication parameter indicating how many times the fixed text is to be repeated. The C can precede single-byte characters such as those used, for example, to write English or German. Both 1 and C are the default values for a **TEXT** subcommand. The text you want inserted appears between single quotation marks. Observe how the **POSITION** subcommands change to accommodate both fixed text and record-1 text.

Note: Each **PRINTLINE** command in your PPFA command stream should have a corresponding record in the input data file. If you specify a fixed-text data field and an input data field under the same **PRINTLINE** command, they are both associated with the same input data file record. However, if all the **FIELD** commands under a **PRINTLINE** command specify fixed text, the corresponding input record is discarded. In that case, you should insert a blank record into the input data file to preserve the correct relationship between records and **PRINTLINE** commands.

Figure 66 on page 119 shows how the finished output looks.



INDIVIDUAL SALES REPORT
ACME CORP. - CHICAGO

Regional Mgrs. Submit
First Monday in Each Month

Southwest Region
Jim Jones - Manager

SALESMAN John Smith

TERRITORY Texas **NO.** 07714

MONTH Nov.

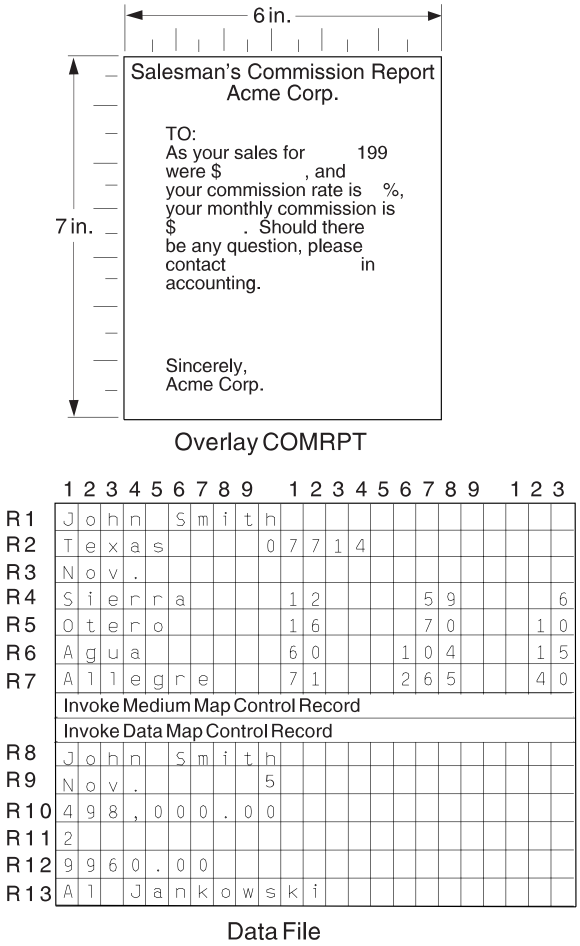
MODEL	UNITS	$ (000)	% of TOTAL
Sierra	12	59	6
Otero	16	70	10
Agua	60	104	15
Allegre	71	265	40

Figure 66. The Corporate Version of the Sales Report with Fixed Text

Combining Two Reports into One Printout

This example combines two data files and two page layouts into one printout, also building on "Combining Field Processing and an Electronic Overlay" on page 113.

Figure 67 shows the new data and a new overlay.



Salesman's Commission Report
Acme Corp.

TO:
As your sales for 199
were $, and
your commission rate is %,
your monthly commission is
$. Should there
be any question, please
contact in
accounting.

Sincerely,
Acme Corp.

```
R1  John Smith
R2  Texas    07714
R3  Nov.
R4  Sierra   12    59     6
R5  Otero    16    70    10
R6  Agua     60   104    15
R7  Allegre  71   265    40
    Invoke Medium Map Control Record
    Invoke Data Map Control Record
R8  John Smith
R9  Nov.     5
R10 498,000.00
R11 2
R12 9960.00
R13 Al Jankowski
```

Figure 67. Input for a New Report Produced from the Combined Data Files

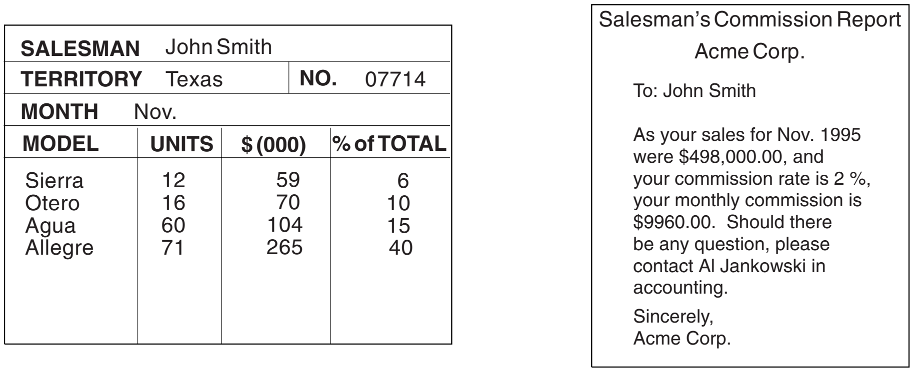
Here is the command stream needed to generate both pages of the preceding report:

```
FORMDEF SLSCOM ;
  COPYGROUP SLSRPT ;
    OVERLAY SLSRPT ;
    SUBGROUP OVERLAY SLSRPT ;
  COPYGROUP COMRPT ;
    OVERLAY COMRPT ;
    SUBGROUP OVERLAY COMRPT ;
PAGEDEF SLSCOM ;
  FONT M104 ;
  FONT M105 ;
  PAGEFORMAT SLSRPT ;                   /*SALES REPORT*/
    PRINTLINE  FONT M104
               POSITION 2 IN .5 IN ;
      FIELD START 1 LENGTH 23 ;
    PRINTLINE  POSITION 2 IN .75 IN ;
      FIELD START 1 LENGTH 9 ;          /*DEFAULT FIELD POSITION*/
      FIELD START 10 LENGTH 5
```

```
          POSITION 2.3 IN * ;
  PRINTLINE POSITION 1.5 IN 1 IN ;
    FIELD START 1 LENGTH 4 ;
  PRINTLINE  REPEAT 4
             POSITION .3 IN  1.8 IN ;
    FIELD START 1 LENGTH 7 ;          /*DEFAULT FIELD POSITION */
    FIELD START 11 LENGTH 3
          POSITION 1.5 IN * ;
    FIELD START 16 LENGTH 3
          POSITION 3 IN * ;
    FIELD START 21 LENGTH 3
          POSITION 4.3 IN * ;
PAGEFORMAT  COMRPT ;                  /*COMMISSION REPORT      */
  PRINTLINE  FONT M105                /*RECORD 8               */
             POSITION 1.3 IN  1.7 IN ;
    FIELD START 1 LENGTH 18 ;
  PRINTLINE POSITION 3.3 IN 2.2 IN ;  /*RECORD 9               */
    FIELD START 1 LENGTH 4 ;          /*DEFAULT FIELD POSITION */
 FIELD START 10 LENGTH 1
          POSITION 1.7 IN * ;
PRINTLINE POSITION 1.9 IN 2.6 IN ;    /*RECORD 10              */
  FIELD START 1 LENGTH 10 ;
PRINTLINE POSITION 4.2 IN 2.9 IN ;    /*RECORD 11              */
  FIELD START 1 LENGTH 1 ;
PRINTLINE POSITION 1 IN 3.7 IN ;      /*RECORD 12              */
  FIELD  START 1 LENGTH 7 ;
PRINTLINE POSITION 1.7 IN 4.2 IN ;    /*RECORD 13              */
  FIELD START 1 LENGTH  15 ;
```

Although requiring a complex series of commands, the following commission report is handled much like any other field processing problem: the data must be carefully mapped into the overlay exactly where it is wanted. If, as in this example, you change copy groups and page formats, both the Invoke Medium Map structured field and the Invoke Data Map structured field must be inserted into the data file where the changes are desired. Here they occur together.

Figure 68 shows both the commission report and the sales report. With page printers and with careful data positioning, such reports look like they were individually prepared with no differences in the presentation of the fixed data.



SALESMAN John Smith			
TERRITORY Texas		**NO.** 07714	
MONTH Nov.			
MODEL	**UNITS**	**$ (000)**	**% of TOTAL**
Sierra	12	59	6
Otero	16	70	10
Agua	60	104	15
Allegre	71	265	40

Salesman's Commission Report
Acme Corp.

To: John Smith

As your sales for Nov. 1995 were $498,000.00, and your commission rate is 2 %, your monthly commission is $9960.00. Should there be any question, please contact Al Jankowski in accounting.

Sincerely,
Acme Corp.

Figure 68. The Sales and the Commission Reports

Chapter 6. Conditional Processing

Conditional processing allows you to test fields within an input line data record (for example, a customer number). Based on the results of the test, you can specify the action to be taken such as to change copy groups or page formats. This section provides:

- An explanation of how conditional processing works
- A detailed list of rules, restrictions, and considerations
- Examples showing how conditional processing can be used to perform some commonly-requested functions

General Description

Conditional processing allows you to:

- Test the input data using the **CONDITION** command.
- Choose the copy group and page format to be used when printing the data.
- Change to a different copy group or page format after the data has been read. You can specify that the new copy group or page format is to be used:
  - Before printing the current subpage
  - Before printing the current line
  - After printing the current line
  - After printing the current subpage

Table 6 shows the tasks you may perform with conditional processing.

Table 6. Conditional Processing Tasks

Tasks	**Location of the Example**
Stack offset from previous jobs	“Jog Output Example” on page 136
Use different print directions for front and back sides of a sheet	“Duplex Output with Different Front and Back Print Directions” on page 136
Record reprocessing example	“Record Reprocessing Example” on page 137
Select different paper sources	“Selecting Paper from an Alternate Bin Example” on page 138
Multiple **CONDITION** commands	“Multiple CONDITION Commands” on page 139
Repeat **PRINTLINE** commands	“Field Processing When PRINTLINEs Are Repeated” on page 142

Using Conditional Processing versus Normal Line Data Processing

Normal line-data processing consists of:

- Setting up the physical page environment by defining a copy group
- Setting up the logical page environment by defining a page format

Input records correspond to **PRINTLINE** commands that determine such things as where the input records are to be printed, which font to use and what print direction to use. Only one copy group and page format can be used for processing each input record.

Conditional processing acts as a preprocessor by allowing you to test the input data before deciding which copy group and page format to use. Furthermore, you can change these specifications based on changes in the input data. Except for record reprocessing (explained on page 127), once the copy group and page-format specifications have been made, conditional processing operates the same as normal line-data processing.

Note: The copy group and page format can also be changed by placing Advanced Function Presentation data stream (AFP data stream) Invoke Medium Map (IMM) and Invoke Data Map (IDM) structured fields in the input data. Use of these structured fields within the input print file causes results that differ from what is described in this section. Refer to *Mixed Object Document Content Architecture Reference* for information about these structured fields.

Using Conditional Processing to Set Up the Environment

Setting up the environment consists of selecting a copy group and a page format.

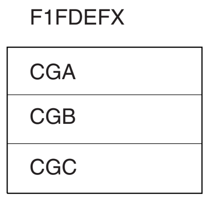
Selecting a Copy Group

Conditional processing can be used to *select* a copy group; it does not *process* the copy group.

As described in Chapter 2, “Using Form Definition Commands,” on page 21, a form definition contains the controls that govern the physical page on which the print file is to be printed. A form definition can contain one or more copy groups as shown in the following diagram.

PPFA Commands	Resulting Form Definition

```
FORMDEF FDEFX
.
.
COPYGROUP CGA
  .
  .
  OVERLAY ...
  SUBGROUP ...
  .
COPYGROUP CGB
  .
  .
  OVERLAY ...
  SUBGROUP ...

COPYGROUP CGC
  .
  .
  OVERLAY ...
  SUBGROUP ...
  .
```



The first copy group within a form definition is always active when processing of a print file begins. To select a different copy group, use the **CONDITION** command.

Note: By using the **BEFORE SUBPAGE** and **BEFORE LINE** parameters with conditional processing, you can change to a different active copy group before any lines have actually been formatted.

Using the previous diagram as a reference, assume copy group CGB is active. The copy-group selections that can be made from a **CONDITION** command are:

condname	which starts the named copy group
CURRENT	which *re*starts copy group CGB
=	which *re*starts copy group CGB (alternate for **CURRENT**)
NEXT	which starts copy group CGC
FIRST	which starts copy group CGA
NULL	which does *not* make any change to the current copy group processing
/	which does *not* make any change to the current copy group processing (alternate for **NULL**)

See "Using the CONDITION Command to Select a Copy Group and a Page Format" on page 134 for more information on each of these options.

Selecting a Page Format

Conditional processing can be used to *select* an active page format. Selecting the page format does not change the basic rules for processing a page format:

- **PRINTLINE** commands are processed sequentially unless skip-to-channel or spacing commands are used.
- When the end of the page format is reached, processing returns to the first **PRINTLINE** command in the same page format. Processing does *not* continue with the next page format (if any) in the page definition.

However, conditional processing does involve some additional considerations:

- Subpages

  A page format consists of one or more subpages. A subpage is defined by a group of **PRINTLINE** commands followed by an **ENDSUBPAGE** command. If an **ENDSUBPAGE** command is not defined, then the entire page format is one subpage. See "Subpage Description and Processing" on page 126 for more information.
- Record reprocessing

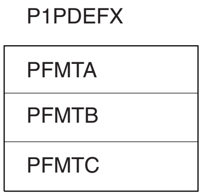
  Record reprocessing is used when input records are processed according to one set of copy-group and page-format specifications, and then new specifications are invoked for the same input records. See "Record Reprocessing Description and Processing" on page 127 for more information.

As described in Chapter 3, "Using Page Definition Commands for Traditional Line Data," on page 35, a page definition is a set of controls for formatting line-data and unformatted ASCII files (typically AIX) for printing on a logical page. A page definition can contain one or more page formats as shown in the following diagram.

PPFA Commands

```
PAGEDEF PDEFX
.
.
PAGEFORMAT PFMTA
  .
  .
  PRINTLINE ...
  PRINTLINE ...
  .
PAGEFORMAT PFMTB
  .
  .
  PRINTLINE ...
  PRINTLINE ...
  .

PAGEFORMAT PFMTC
  .
  .
  PRINTLINE ...
  PRINTLINE ...
  .
```

Resulting Page Definition



The first page format in the page definition is always active when processing of the print file begins. To invoke a new page format, use the **CONDITION** command.

Note: By using the **BEFORE SUBPAGE** and **BEFORE LINE** parameters, it is possible to change to a different active page format before any lines have actually been formatted.

Using the previous diagram as a reference, assume page format PFMTB is active. The page-format selections that can be made from a **CONDITION** command are:

condname	which starts the named page format
CURRENT	which *re*starts page format PFMTB
=	which *re*starts page format PFMTB (alternate for **CURRENT**)
NEXT	which starts page format PFMTC
FIRST	which starts page format PFMTA
NULL	which does *not* make any change to the current page format processing
/	which does *not* make any change to the current page format processing (alternate for **NULL**)

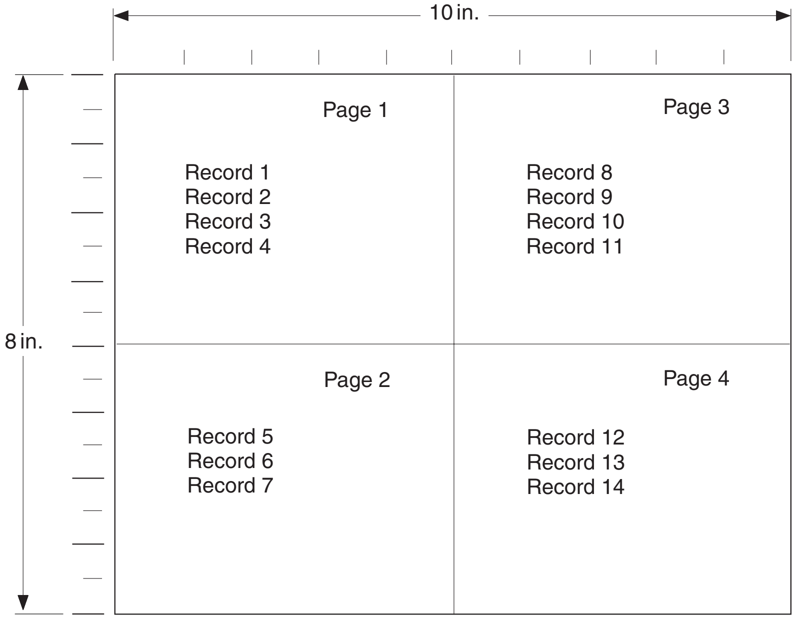
See “Using the CONDITION Command to Select a Copy Group and a Page Format” on page 134 for more information on each of these options.

Subpage Description and Processing

A page format consists of one or more subpages. A subpage is defined by a group of **PRINTLINE** commands followed by an **ENDSUBPAGE** command. If an **ENDSUBPAGE** command is not defined, then the entire page format is one subpage. The following considerations apply to subpages:

- Subpages are necessary only with conditional processing.

  Multiple-up printing can be done with or without subpages being defined, but to change the page format or copy group at the level of one of the multiple-up pages, the multiple-up pages must be defined as subpages. In the following diagram, pages 1 through 4 can be defined as four separate subpages within one page format, or all defined within one subpage. However, in order to present the data on page 3 (for example) in a format different from that used for pages 1 and 2, the four pages must be defined as subpages.



- A subpage is processed sequentially starting from the beginning of the page format. Moving from one subpage to the next subpage is done by processing all the **PRINTLINE** commands for a given subpage, or by skipping (by means of the **CHANNEL** subcommand) or spacing to a **PRINTLINE** command in a different subpage.

  Note: Conditional processing cannot be used to select a subpage except by default. When a page format is started (or the *current* one is restarted), processing begins with the first **PRINTLINE** command of the page format. The effect is to select the first subpage in the page format.

Record Reprocessing Description and Processing

Record reprocessing is used when input records are processed according to one set of copy group and page format specifications, and then new specifications are invoked for the same input records. If the new specifications are to be applied using either the **BEFORE SUBPAGE** or the **BEFORE LINE** parameter, then the input records must be processed again using the new specifications instead of the original ones.

Note: Input records are not printed twice; record reprocessing just changes the specifications used when formatting the records.

The process is shown in the following diagram.

PPFA Commands

```
PAGEFORMAT PFMTA ;

  PRINTLINE POSITION 1 IN 1 IN
            DIRECTION ACROSS
            REPEAT 5 ;

  CONDITION cond1
    START 2 LENGTH 1
    WHEN EQ 'B'
    BEFORE SUBPAGE
      NULL PAGEFORMAT PFMTB ;


PAGEFORMAT PFMTB ;

  PRINTLINE POSITION 7 IN 1 IN
            DIRECTION DOWN
            REPEAT 5 ;

  CONDITION cond2
    START 4 LENGTH 1
    WHEN EQ 'Y'
    BEFORE SUBPAGE
      NULL PAGEFORMAT PFMTA ;
```

Input Records

	A			
	A			
	B			
	A			
	A			

Assume page format PFMTA is active. Under normal processing the first input record would print in the **ACROSS** direction, starting at a horizontal offset of 1 inch and a vertical offset of 1 inch. However, the third record satisfies the **CONDITION** statement and causes a new page format (PFMTB) to be started. Since **CONDITION** *cond1* specifies **BEFORE SUBPAGE**, the first two records must be *reprocessed* using page format PFMTB. As a result, all of the records are printed in a **DOWN** direction, starting at a horizontal offset of 7 inches and a vertical offset of 1 inch.

If allowed to operate without restrictions, record reprocessing could force PSF into an infinite loop. For example:

PPFA Commands

```
PAGEFORMAT PFMTA ;

  PRINTLINE POSITION 1 IN 1 IN
            DIRECTION ACROSS
            REPEAT 5 ;

  CONDITION cond1
    START 2 LENGTH 1
    WHEN EQ 'B'
    BEFORE SUBPAGE
      NULL PAGEFORMAT PFMTB ;


PAGEFORMAT PFMTB ;

  PRINTLINE POSITION 7 IN 1 IN
            DIRECTION DOWN
            REPEAT 5 ;

  CONDITION cond2
    START 4 LENGTH 1
    WHEN EQ 'Y'
    BEFORE SUBPAGE
      NULL PAGEFORMAT PFMTA ;
```

Input Records

	A		X	
	A		X	
	B		X	
	B		X	
	B		Y	

As in the previous example, page format PFMTA is initially active, and input record 3 results in the selection of page format PFMTB. However, page format PFMTB has a condition that checks position four for the character ‘Y’, which is satisfied by input record 5. Therefore, if there were no restrictions, page format PFMTA would again be selected, the input data would be reprocessed (starting with input record 1), leading to an infinite loop.

To prevent this situation, after a **BEFORE** condition has been satisfied, all other **BEFORE** conditions are ignored until data has actually been formatted. See “Record Reprocessing” on page 130 for detailed information on this restriction.

Conditional Processing Rules, Restrictions, and Considerations

Multiple Conditions

Conditional processing supports:
- Multiple **PRINTLINE** commands in each subpage
- Multiple **CONDITION** commands on one **PRINTLINE** command
- Multiple **WHEN** statements on one **CONDITION** command

Rule

For *all these situations*, the rule is the same; the *first* true condition is the one processed, and any following true conditions are ignored.

Conditional Processing Considerations

Conditions are evaluated when they are encountered. For example, if a true condition has not been detected when an **OTHERWISE** statement is encountered, the **OTHERWISE** statement always results in a true condition. (An exception to this is explained in “Interaction Between the CONDITION Command and the CHANNEL Subcommand” on page 131.)

See “Multiple CONDITION Commands” on page 139 for an example of multiple **CONDITION** commands.

Record Reprocessing

Conditional Processing Restrictions

To prevent an infinite program loop, be aware that the following restrictions apply:

1. When the conditional action is to take place *before* the current subpage:
   a. Actions specified as taking place before the current subpage are shut off until the current subpage end.
   b. Actions specified as taking place before the current line are shut off for one line (the first line processed in the subpage).
2. When the conditional action is to take place before the current line, actions specified as taking place before the current subpage or before the current line are shut off for one line.

Considerations

- If a *before subpage* condition is true and causes a switch to a new page format, all *before subpage* conditions in the new page format are *ignored*.
- If a *before line* condition is true and causes a switch to a new page format, all *before subpage* and *before line* conditions in the new page format are ignored until one line has been processed.

The consequence of this is that, after a true condition, at least one line must be processed before the next *before* condition is considered. This can be confusing because a condition that would otherwise yield a true result can be ignored.

See “Record Reprocessing Example” on page 137 for an example of record reprocessing.

Interaction Between a CONDITION Command and a REPEAT Subcommand

See “Interaction Between the CONDITION Command and the CHANNEL Subcommand” on page 131 for what can appear to be an exception to the following rules.

Rule for a CONDITION Command and a REPEAT Subcommand

The **REPEAT** subcommand is used with the **PRINTLINE** command to specify the number of printlines (usually greater than one) that are to be constructed with the same specifications (font, direction, and so on). The **CONDITION** command is used to invoke conditional processing based on the data in a particular line. When the **REPEAT** and **CONDITION** commands are both specified for the same **PRINTLINE** command, *every line* described by the **PRINTLINE** command is checked for the given condition until either the condition is satisfied or there are no more lines described by the **PRINTLINE** command.

Note: This is different from the way in which the **CHANNEL** and **POSITION** subcommands interact with the **PRINTLINE** command. These two subcommands apply only to the *first line* described by the **PRINTLINE** command.

Rule for a CONDITION Command With an OTHERWISE Subcommand

The **REPEAT** subcommand is used with the **PRINTLINE** command to specify the number of printlines (usually greater than one) that are to be constructed with the same specifications (font, direction, and so on). The **CONDITION** command is used to invoke conditional processing based on the data in a particular line. The **CONDITION** command includes one or more **WHEN** subcommands and may include an **OTHERWISE** subcommand. If an **OTHERWISE** is coded, and none of the preceding **WHEN** conditions are true, the **OTHERWISE** condition *is always true*. If an **OTHERWISE** command is not coded, it is treated as a null.

Considerations

For the situation where **REPEAT** and **CONDITION** with **OTHERWISE** are coded for the same **PRINTLINE** command, the *first* input line determines the processing to be performed. This happens because either one of the **WHEN** conditions or the **OTHERWISE** condition is always true for the very first line.

Interaction Between the CONDITION Command and the CHANNEL Subcommand

Rule

A condition is checked if its associated **PRINTLINE** command is *actually processed*.

Note: ANSI carriage controls and machine (EBCDIC) carriage controls are processed differently. See the **SPACE_THEN_PRINT** subcommand in "Subcommands (Long Form)" on page 306 for more information.

ANSI	A skip or space occurs before printing the line.
Machine	The line is printed and then skipping or spacing is done.

For a **CONDITION** to be checked, it must be associated with the **PRINTLINE** command that is actually used for printing.

ANSI Skipping Consideration

The **PRINTLINE** command is not processed if a skip-to-channel-n character in the carriage control field causes the given **PRINTLINE** command not to be processed.

If a data record contains a character '1' (for example) in the carriage control field, and a **PRINTLINE** command has been specified with **CHANNEL 1** subcommand, the data record is processed under the "new" **PRINTLINE** command (the one that specified **CHANNEL 1**). Any **CONDITION** associated with the "old" **PRINTLINE** command is ignored (never even checked). See the following diagram for an example of this.

The character '1' in the carriage-control field of the fifth input record causes a page end before condition *cond1* is ever checked. Thus, the fifth input record is processed using the first **PRINTLINE** command of the current page format.

PPFA Commands

```
PAGEFORMAT PFMTA ;

  PRINTLINE CHANNEL 1 ;
  PRINTLINE ;
  PRINTLINE ;
  PRINTLINE ;
  PRINTLINE ;
    CONDITION cond1
      START 6 LENGTH 1
      WHEN EQ '5'
      AFTER SUBPAGE
      CURRENT NULL;
```

Input Records

Carriage Control	1	2	3	4	5	6
	L	I	N	E		1
	L	I	N	E		2
	L	I	N	E		3
	L	I	N	E		4
1	L	I	N	E		5

Considerations

The **PRINTLINE** command is not processed if the **PRINTLINE** command is spaced over, for example, when multiple line spacing causes certain **PRINTLINE** commands to be bypassed.

If the input-record carriage-control field specifies a double space before print (for example), and a **CONDITION** command is specified for the spaced line, the **CONDITION** is ignored (never checked). Because the **OTHERWISE** subcommand is part of a **CONDITION** command, the **OTHERWISE** subcommand is also ignored.

This can be confusing. You might expect an **OTHERWISE** condition to be true if all other conditions have failed. In fact, the **OTHERWISE** condition can be true if it is associated with a **PRINTLINE** command that is actually processed. See the following diagram for an example of this. This assumes ANSI carriage controls have been specified for this print file. ANSI carriage control ‘0’ means space two lines before printing.

The fifth input record contains data (character ‘5’ in the sixth position) that would normally satisfy the condition specified on the fifth **PRINTLINE** command. However, the character ‘0’ in the carriage control field of input record 4 causes the fifth **PRINTLINE** command to be ignored. The fifth input record is processed by the sixth **PRINTLINE** command; therefore, the condition is not satisfied.

PPFA Commands

```
PAGEFORMAT PFMTA ;

  PRINTLINE CHANNEL 1 ;
  PRINTLINE ;
  PRINTLINE ;
  PRINTLINE ;
  PRINTLINE ;
    CONDITION cond1
      START 6 LENGTH 1
      WHEN EQ '5'
      AFTER SUBPAGE
      CURRENT NULL;
  PRINTLINE ;
```

Input Records

Carriage Control	1	2	3	4	5	6
	L	I	N	E		1
	L	I	N	E		2
	L	I	N	E		3
0	L	I	N	E		4
	L	I	N	E		5
	L	I	N	E		6

WHEN CHANGE is Always False at Start of a Page Format

Rule

The **WHEN CHANGE** process compares the contents of a given field with the contents of the same field in the last record that was processed *with the current page format* and *current condition*. Whenever a page format is started (either by a condition that *changes* page formats or when processing of the *data file begins*), a **WHEN CHANGE** condition is always false because the previous record was not processed with the *current* page format.

Note: The following meanings apply to the previous statement:

changes	switching to a page format that has a different name
data file begins	if conditional processing invokes the **CURRENT** data map, **CHANGE** information is retained

Considerations

Ensure that the **WHEN CHANGE** statement is processed before the switch to a new page format has been performed. See "WHEN CHANGE is Always False at Start of a Page Format" for an example of how a combination of **WHEN CHANGE BEFORE SUBPAGE** and **WHEN CHANGE AFTER SUBPAGE** can lead to unexpected results.

Relationship of CC and TRC fields to the START Subcommand

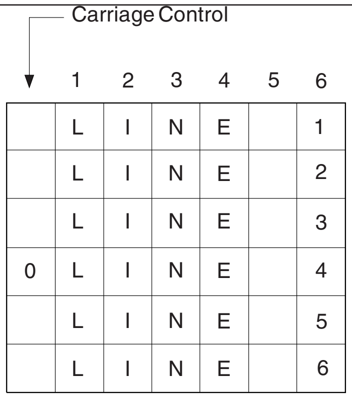
Rule

The position specified by the **START** subcommand of the **CONDITION** command is in reference to the start of the *data record*. The first one or two bytes of an input record may contain either both a carriage-control character (CC) or a table-reference character (TRC). However, these characters are not considered part of the data record and are not to be counted when determining the **START** subcommand value. In the following example, the field being checked is actually the seventh character of the input record, but is the sixth character of the data record.

PPFA Commands

```
PAGEFORMAT PFMTA ;

  PRINTLINE CHANNEL 1 ;
  PRINTLINE ;
  PRINTLINE ;
  PRINTLINE ;
  PRINTLINE ;
    CONDITION cond1
      START 6 LENGTH 1
      WHEN EQ '5'
      AFTER SUBPAGE
      CURRENT NULL;
  PRINTLINE ;
```

Input Records



	1	2	3	4	5	6
	L	I	N	E		1
	L	I	N	E		2
	L	I	N	E		3
0	L	I	N	E		4
	L	I	N	E		5
	L	I	N	E		6

Using the CONDITION Command to Select a Copy Group and a Page Format

Rules

1. Within the **CONDITION** command, a copy group and a page format can be specified by using either a specific name or a parameter (**CURRENT** or **=**, **FIRST**, **NEXT**) or **NULL** or / can be specified. The use of the **NULL** or / parameters differs from the use of the others:

Others	When any parameter other than **NULL** or / is specified, the specifications for the copy group or page format selected replace the current specifications. When the current specifications are replaced, the action is referred to as starting or restarting the copy group or page format. In AFP terminology, an Invoke Medium Map (IMM) command is generated for a copy group and an Invoke Data Map (IDM) command is generated for a page format.
NULL or /	When **NULL** or / is specified, no IMM or IDM is generated and processing continues as if no condition check was present.

2. The **COPYGROUP** and the **PAGEFORMAT** parameters are positional. If both parameters are specified, the **COPYGROUP** parameter must be first. If you want only to specify the copy group, the **PAGEFORMAT** parameter can be omitted, or specified as **NULL** or /. However, if you want only to specify the page format, the **COPYGROUP** parameter must be specified as **NULL** or /.

Considerations

Starting or Restarting a Copy Group: When a copy group is started (or restarted), the remaining input data is forced to the start on the next *sheet*. Therefore, if duplex output was expected, but the copy group is restarted while processing the front side of a sheet, the remaining data starts on the front side of the *next* sheet rather than on the back side of the current sheet.

See “Duplex Output with Different Front and Back Print Directions” on page 136 for an example.

Furthermore, observe that any copy group action except **NULL** restarts the page format (see the following item).

Starting or Restarting a Page Format: When a page format is started (or restarted), the remaining input data is forced to the start on the next side. Furthermore, that data is processed starting with the first **PRINTLINE** command in the specified page format. This is true even if **CURRENT** is specified as the page format parameter.

Not Restarting a Copy Group: If the copy group is not to be restarted, specify **NULL** or /. Do *not* specify **COPYGROUP NULL** or **COPYGROUP** /.

The following example illustrates this point. The command sequence on the left invokes a copy group named **NULL**. The command sequence on the right leaves the current copy group active.

Incorrect Format

```
CONDITION condname
          START ...
          .
          .
          .
          WHEN ...
            COPYGROUP NULL
          .
          .
```

Correct Format

```
CONDITION condname
          START ...
          .
          .
          .
          WHEN ...
            NULL
          .
          .
```

Not Restarting a Page Format: If the page format is not to be restarted, specify **NULL** or / (or omit the specification). Do *not* specify **PAGEFORMAT NULL** or **PAGEFORMAT** /.

The following example illustrates this point. The command sequence on the left invokes a page format named **NULL**. The command sequence on the right leaves the current page format active.

Incorrect Format

```
CONDITION condname
          START ...
          .
          .
          .
          WHEN ...
            COPYGROUP CGA
            PAGEFORMAT NULL
          .
          .
```

Correct Format

```
CONDITION condname
          START ...
          .
          .
          .
          WHEN ...
            COPYGROUP CGA
            NULL
          .
          .
```

Variable Length Records and the CONDITION Command

Considerations

The **CONDITION** command inspects a field that starts at a particular position and extends for a certain length. If the *entire* field is not available within the input record, the condition is always false. If the input file contains variable-length records, the record may not extend the full length specified by the **START** and **LENGTH** subcommands. In this way, a condition which seems as if it should be satisfied can actually fail.

Truncation of Blanks and the CONDITION Command

Considerations

Truncation occurs when blank characters are removed from the end of records on the spool. If blank truncation is in effect, the result can be the same as if the input file contained variable-length records.

Blank truncation is a consideration at the time the input records are passed to the print server. In the JES2 environment, blank truncation occurs unless the **BLNKTRNC=NO** parameter is specified. In the JES3 environment, blank truncation occurs unless the **TRUNC=NO** parameter is specified as part of either the **BUFFER** or **SYSOUT** initialization statements. Blank truncation can affect conditional processing since a field could “disappear” by being truncated causing no **WHEN/OTHERWISE** clause to be executed.

Conditional Processing Examples

This section provides conditional processing examples. The examples are grouped into functionally similar applications and are increasingly complex. The examples provided are:
- Jog output based on a change in the input data
- Duplex output with different front and back print directions
- Record reprocessing
- Select paper from an alternate bin
- Multiple **CONDITION** commands

Jog Output Example

This example shows how to jog the printed output, based on a change in the input data.

Copy group CGJOG specifies *JOG YES*. Page format PFJOG contains a **CONDITION** command that checks for any change in positions 8 through 10. If a change is detected, copy group CGJOG is restarted. Observe that the only result is to start printing on a new sheet and to jog that sheet.

Jog Output Example

```
FORMDEF TJOG;
  COPYGROUP CGJOG JOG YES;

PAGEDEF TJOG;
  PAGEFORMAT PFJOG WIDTH 11 IN HEIGHT 8.5;
    PRINTLINE REPEAT 50
              CHANNEL 1;
    CONDITION NUPAGE START 8 LENGTH 3
      WHEN CHANGE BEFORE SUBPAGE
      COPYGROUP CGJOG;
```

Duplex Output with Different Front and Back Print Directions

This example shows how to establish one print direction on the front side and a different print direction on the back side of a duplex sheet.

The page definition in this example contains two page formats, each of which has a **CONDITION** statement that always returns a true value. The value is true because the character in position 1 always has a value greater than or equal to hexadecimal zero. Therefore, every time a page change occurs (front to back, or back to next front) a different page format is started. The different **DIRECTION** statements in the two page formats change the layout of the text on the page.

Observe that the **COPYGROUP** parameter is specified as **NULL**. If a parameter other than **NULL** or / is specified for **COPYGROUP**, the copy group restarts every time a page change occurs. Because restarting a copy group forces data to a new sheet, duplex printing *does not occur*.

Duplex Output

```
FORMDEF XMPDUP
        DUPLEX NORMAL;

PAGEDEF XMPDUP WIDTH 8.5  HEIGHT 11.0;
  PAGEFORMAT  P2FRONT DIRECTION ACROSS;
    PRINTLINE CHANNEL 1 POSITION   0.75   TOP;
      CONDITION GOTOBACK START 1 LENGTH 1
        WHEN GE X'00'  AFTER SUBPAGE NULL  PAGEFORMAT P2BACK;
    PRINTLINE REPEAT 59;

  PAGEFORMAT  P2BACK DIRECTION UP;
    PRINTLINE CHANNEL 1 POSITION   0.25   TOP;
      CONDITION GOTOFRNT START 1 LENGTH 1
        WHEN GE X'00'  AFTER SUBPAGE NULL PAGEFORMAT P2FRONT;
    PRINTLINE REPEAT 59;
```

Record Reprocessing Example

This example uses the **BEFORE SUBPAGE** function with record reprocessing because the copy group and page format cannot be determined until input record 3 for each subpage has been read.

Notes:

1. This example includes two subpages.
2. The **CONDITION** command specifies that the action to be performed is **NEWFORM**. Therefore, if the condition is satisfied, the data in the current subpage is forced to start on the next form. If the data is already at the start of a new form, no action is performed. In other words, a blank page is not generated.

Record Reprocessing Example

```
/* Page definition for 2-up printing            */
/* Test field in line 3 of each subpage          */
/* Eject to new sheet if the field changes.      */

PAGEDEF REPROC
        WIDTH  10.6 HEIGHT 8.3 DIRECTION DOWN;

  PAGEFORMAT  PFREPROC;

    /* Definition of first subpage               */
    PRINTLINE CHANNEL 1
              REPEAT 2
              POSITION MARGIN TOP;

    PRINTLINE REPEAT 1
              POSITION MARGIN NEXT;
              CONDITION EJECT
                START 5 LENGTH 5
                WHEN CHANGE BEFORE SUBPAGE
                NEWFORM;

    PRINTLINE REPEAT 40
              POSITION MARGIN NEXT;
    ENDSUBPAGE;

    /* Definition of second subpage             */
    PRINTLINE CHANNEL 1
              REPEAT 2
              POSITION 5.3 TOP;

    PRINTLINE REPEAT 1
              POSITION 5.3 NEXT;
              CONDITION EJECT;

    PRINTLINE REPEAT 40
              POSITION 5.3 NEXT;
    ENDSUBPAGE;
```

Selecting Paper from an Alternate Bin Example

This example selects the first sheet from the alternate bin and all other pages from the primary bin. This function is useful when special paper (such as one having the company logo) is to be used for the first page of a document.

Note: Bin selection is overridden by the printer should the form defined to each bin be the same form number. Only the primary bin is selected.

Alternate Bin Example

```
/* The form definition contains two copy groups --  */
/*   ALTBIN - for the first page                    */
/*   PRIBIN - for all other pages                   */

FORMDEF BINEX
        DUPLEX NO;
  COPYGROUP ALTBIN BIN 2;
  COPYGROUP PRIBIN BIN 1;

PAGEDEF BINEX
        WIDTH 8.3  HEIGHT 10.6;

  /* Pageformat for first page - bin 2               */

  PAGEFORMAT FIRST;
    PRINTLINE CHANNEL 1
              POSITION MARGIN TOP;
    CONDITION GOTOPRIM  START 1 LENGTH 1
      WHEN GE X'00'  AFTER SUBPAGE
      COPYGROUP PRIBIN PAGEFORMAT REST;
    PRINTLINE REPEAT 59;

  /* Pageformat for all other pages - bin 1          */

   PAGEFORMAT REST;
     PRINTLINE CHANNEL 1
               POSITION MARGIN TOP
               REPEAT 60;
```

Multiple CONDITION Commands

Two examples are shown here. The first example shows how two **CONDITION** commands can interact to give unintended results. The second example shows how to use the two **CONDITION** commands to achieve the correct results.

Example 1 Multiple CONDITION Command—Incorrect Solution

The example in Figure 70 on page 142 demonstrates how two **CONDITION** commands can interact to give unintended results. Specifically, one **CONDITION** command causes a change of page format and then a second **CONDITION** command inspects a field with a **WHEN CHANGE** subcommand.

The purpose of condition:

NEWREP	Starts a new report on a new sheet of paper whenever the specified field changes and jogs the output so the report can be easily located.
SHIFTB and SHIFTF	Handles the situation where all four subpages of the front (or back) contain data. In this situation, the objective is to change the print direction of the text on the page.

In the situation where both conditions *seem* to be true at the same time, the results may be unexpected.

Note: Condition **SHIFTB** (or **SHIFTF**) takes effect *after* the current subpage and therefore precedes the *before subpage* processing defined by condition

NEWREP. Because condition **SHIFTB** results in starting a new page format, condition **NEWREP** returns a false value, and the expected new report processing is not performed.

Example 2 Multiple CONDITION Command—Correct Solution

The example Figure 69 on page 141 differs from Figure 70 on page 142 in two significant ways:

- Because the page format for the back side is the first one defined in the page definition, it is the one that is initially active
- Both **CONDITION** commands (**NEWREP** and **SHIFTIT**) specify that the action should happen before the current subpage has been processed

When processing begins, condition **NEWREP** fails because this is a **WHEN CHANGE** condition and the page format has just been started. However, condition **SHIFTIT** returns a true result, and the **NEXT** page format (PFFRONT) is started. No lines have been formatted, so condition **SHIFTIT** has the effect of moving to the page format for the front side.

```
FORMDEF XMPICO OFFSET 0 0 DUPLEX RTUMBLE JOG YES REPLACE YES;
  COPYGROUP CG1;
        OVERLAY OVLY1;
        OVERLAY OVLY2;
        SUBGROUP       OVERLAY OVLY1 FRONT;
        SUBGROUP       OVERLAY OVLY2 BACK ;

PAGEDEF XMPICO REPLACE YES;
        FONT GT24;
        FONT GT12;

        /* Definition of pageformat for front side */
        PAGEFORMAT PFFRONT WIDTH 11 IN HEIGHT 8.5 IN DIRECTION UP;
SETUNITS 1 PELS 1 PELS LINESP 16 LPI;
          PRINTLINE REPEAT 1 CHANNEL 1 FONT GT24 POSITION 75 188;
          CONDITION NEWREP START 8 LENGTH 3
            WHEN CHANGE BEFORE SUBPAGE COPYGROUP CG1 PAGEFORMAT PFFRONT;
          PRINTLINE REPEAT 40 FONT GT24 POSITION 75 NEXT;
          ENDSUBPAGE;

          PRINTLINE REPEAT 1 CHANNEL 1 FONT GT24 POSITION 1377 188;
          CONDITION NEWREP START 8;
          PRINTLINE REPEAT 40 FONT GT24 POSITION 1377 NEXT;
          ENDSUBPAGE;

          PRINTLINE REPEAT 1 CHANNEL 1 FONT GT24 POSITION 75 1102;
          CONDITION NEWREP START 8;
          PRINTLINE REPEAT 40 FONT GT24 POSITION 75 NEXT;
          ENDSUBPAGE;

          PRINTLINE REPEAT 1 CHANNEL 1 FONT GT24 POSITION 1377 1102;
          CONDITION NEWREP START 8;
          CONDITION SHIFTB START 1 LENGTH 1
            WHEN GE X'00' AFTER SUBPAGE NULL PAGEFORMAT PFBACK;
          PRINTLINE REPEAT 40 FONT GT24 POSITION 1377 NEXT;
          ENDSUBPAGE;

        /* Definition of pageformat for back side    */
        PAGEFORMAT PFBACK WIDTH 8.5 IN HEIGHT 11 IN DIRECTION ACROSS;
        SETUNITS 1 PELS 1 PELS LINESP 8 LPI;
          PRINTLINE REPEAT 1 CHANNEL 1 FONT GT12 POSITION 75 61;
          CONDITION NEWREP START 8;
          PRINTLINE REPEAT 40 FONT GT12 POSITION 75 NEXT;
          ENDSUBPAGE;

          PRINTLINE REPEAT 1 CHANNEL 1 FONT GT12 POSITION 75 1335;
          CONDITION NEWREP START 8;
          CONDITION SHIFTF START 1 LENGTH 1
            WHEN GE X'00' AFTER SUBPAGE NULL PAGEFORMAT PFFRONT;
          PRINTLINE REPEAT 40 FONT GT12 POSITION 75 NEXT;
          ENDSUBPAGE;
```

Figure 69. INCORRECT Solution Example

```
FORMDEF XMPCOR OFFSET 0 0 DUPLEX RTUMBLE JOG YES REPLACE YES;
  COPYGROUP CG1;
        OVERLAY OVLY1;
        OVERLAY OVLY2;
        SUBGROUP       OVERLAY OVLY1 FRONT;
        SUBGROUP       OVERLAY OVLY2 BACK ;

PAGEDEF XMPCOR REPLACE YES;
        FONT GT24;
        FONT GT12;
        /* The pageformat for the back side of the form is  */
        /* the first pageformat in the PAGEDEF.  Therefore, */
        /* it will initially be the active pageformat       */
        PAGEFORMAT PFBACK WIDTH 8.5 IN HEIGHT 11 IN DIRECTION ACROSS;
SETUNITS 1 PELS 1 PELS LINESP 8 LPI;
          PRINTLINE REPEAT 1 CHANNEL 1 FONT GT12 POSITION 75 61;
          CONDITION NEWREP START 8 LENGTH 3
            WHEN CHANGE BEFORE SUBPAGE COPYGROUP CG1 PAGEFORMAT
            PFFRONT;
          CONDITION SHIFTIT START 1 LENGTH 1
            WHEN GE X'00' BEFORE SUBPAGE NULL NEXT;
          PRINTLINE REPEAT 40 FONT GT12 POSITION 75 NEXT;
          ENDSUBPAGE;

          PRINTLINE REPEAT 1 CHANNEL 1 FONT GT12 POSITION 75 1335;
          CONDITION NEWREP START 8;
          PRINTLINE REPEAT 40 FONT GT12 POSITION 75 NEXT;
          ENDSUBPAGE;

        /* This is the pageformat for the front side of the form. */
        PAGEFORMAT PFFRONT WIDTH 11 IN HEIGHT 8.5 IN DIRECTION UP;
SETUNITS 1 PELS 1 PELS LINESP 16 LPI;
          PRINTLINE REPEAT 1 CHANNEL 1 FONT GT23 POSITION 75 188;
          CONDITION NEWREP START 8;
          CONDITION SHIFTIT START 1;
          PRINTLINE REPEAT 40 FONT GT24 POSITION 75 NEXT;
          ENDSUBPAGE;

          PRINTLINE REPEAT 1 CHANNEL 1 FONT GT24 POSITION 1377 188;
          CONDITION NEWREP START 8;
          PRINTLINE REPEAT 40 FONT GT24 POSITION 1377 NEXT;
          ENDSUBPAGE;

          PRINTLINE REPEAT 1 CHANNEL 1 FONT GT24 POSITION 75 1102;
          CONDITION NEWREP START 8;
          PRINTLINE REPEAT 40 FONT GT24 POSITION 75 NEXT;
          ENDSUBPAGE;

          PRINTLINE REPEAT 1 CHANNEL 1 FONT GT24 POSITION 1377 1102;
          CONDITION NEWREP START 8;
          PRINTLINE REPEAT 40 FONT GT24 POSITION 1377 NEXT;
          ENDSUBPAGE;
```

Figure 70. CORRECT Solution Example

Field Processing When PRINTLINEs Are Repeated

The following examples show the effect of the [**LINE** | **FIELD**] parameter on **REPEAT** *n*.

The first **PRINTLINE** example uses **FIELD** type repetition. The second **PRINTLINE** example shows **LINE** type repetition.

Note: When **LINE** type repetition is used, **SETUNITS LINESP** may need to be set to a higher value to avoid over printing.

REPEAT n type FIELD Example

```
PAGEDEF  rept01  WIDTH      8.0 IN
                 HEIGHT    10.5 IN
                 LINEONE    0.2 IN 0.2 IN
                 DIRECTION ACROSS
                 REPLACE   YES;

   FONT  normal  CR10  SBCS  ROTATION 0;
   FONT  italic  CI10  SBCS  ROTATION 0;
   FONT  bold    CB10  SBCS  ROTATION 0;
   .
   .
   .
   SETUNITS LINESP 6 LPI;

   PRINTLINE  POSITION 1.0 IN 1.0 IN
              DIRECTION ACROSS
              FONT bold
              REPEAT 3 FIELD;
      FIELD   POSITION 0.0 IN 0.0 IN
              DIRECTION ACROSS
              FONT normal
              START * LENGTH 20;
      FIELD   POSITION 2.5 IN 0.0 IN
              DIRECTION DOWN
              FONT normal
              START * LENGTH 20;
      FIELD   POSITION 2.5 IN 2.5 IN
              DIRECTION BACK
              FONT normal
              START * LENGTH 20;
      FIELD   POSITION 0.0 IN 2.5 IN
              DIRECTION UP
              FONT normal
              START * LENGTH 20;
```

REPEAT n type LINE Example

```
⋮
SETUNITS LINESP 3.0 IN;

PRINTLINE  POSITION 5.0 IN 1.0 IN
           DIRECTION ACROSS
           FONT bold
           REPEAT 3 LINE;
   FIELD   POSITION 0.0 IN 0.0 IN
           DIRECTION ACROSS
           FONT normal
           START * LENGTH 20;
   FIELD   POSITION 2.0 IN 0.0 IN
           DIRECTION DOWN
           FONT normal
           START * LENGTH 20;
   FIELD   POSITION 2.0 IN 2.0 IN
           DIRECTION BACK
           FONT normal
           START * LENGTH 20;
   FIELD   POSITION 0.0 IN 2.0 IN
           DIRECTION UP
           FONT normal
           START * LENGTH 20;
```

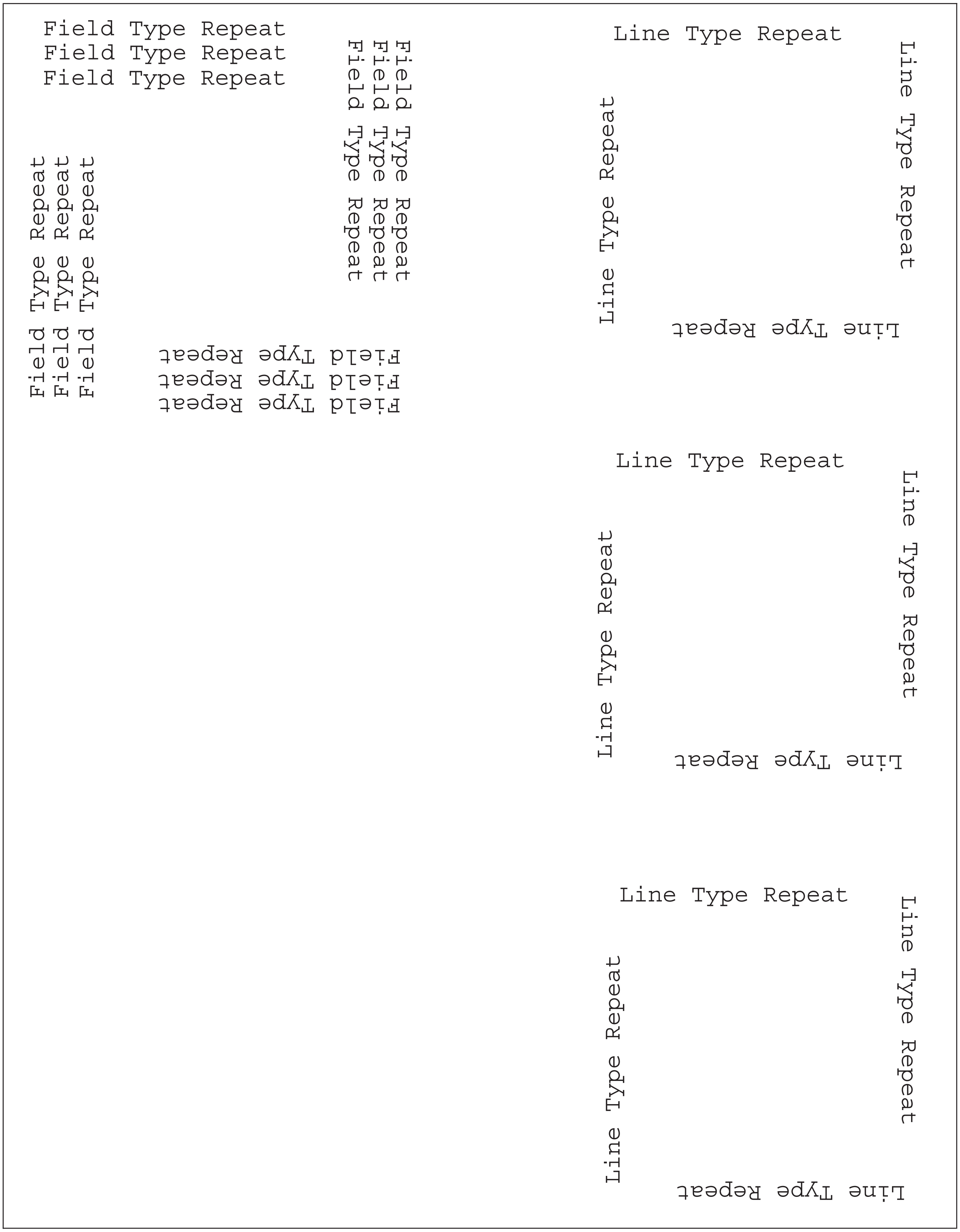
The next example shows Input Line Data.

(Input) Line Data:

```
Field Type Repeat   Field Type Repeat  Field Type Repeat  Field Type Repeat
Field Type Repeat   Field Type Repeat  Field Type Repeat  Field Type Repeat
Field Type Repeat   Field Type Repeat  Field Type Repeat  Field Type Repeat
Line Type Repeat    Line Type Repeat   Line Type Repeat   Line Type Repeat
Line Type Repeat    Line Type Repeat   Line Type Repeat   Line Type Repeat
Line Type Repeat    Line Type Repeat   Line Type Repeat   Line Type Repeat
Field Type Repeat   Notice that the  fields are repeated based on the prior
instance of the same field, and not the  printline. This  has advantages if
special effects are desired.
Line Type Repeat    is based on the     printline.  Good  for sales tickets.
Generally, this type of repeat needs a   SETUNITS LINESP     command...
 ...so that lines    won't overlap!      This is             SETUNITS    LINESP 3 IN
```

Sample Output

When the previous example is processed by the print server, the following output is printed.



Field Type Repeat
Field Type Repeat
Field Type Repeat

Field Type Repeat
Field Type Repeat
Field Type Repeat

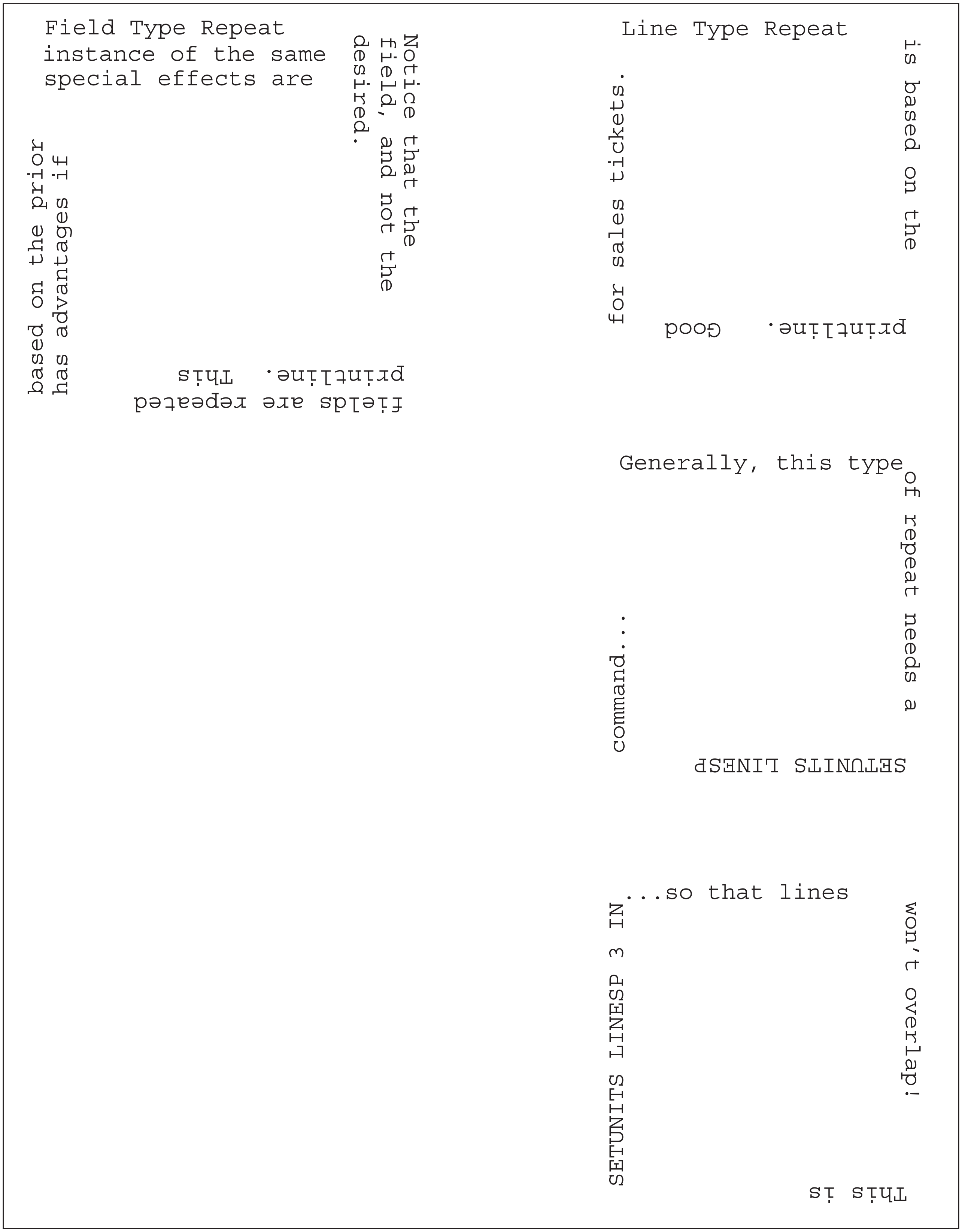
Field Type Repeat
Field Type Repeat
Field Type Repeat

Field Type Repeat
Field Type Repeat
Field Type Repeat

Line Type Repeat
Line Type Repeat
Line Type Repeat
Line Type Repeat

Line Type Repeat
Line Type Repeat
Line Type Repeat
Line Type Repeat

Line Type Repeat
Line Type Repeat
Line Type Repeat
Line Type Repeat



Field Type Repeat
instance of the same
special effects are

Notice that the
field, and not the
desired.

printline. This
fields are repeated

based on the prior
has advantages if

Line Type Repeat

is based on the

printline. Good

for sales tickets.

Generally, this type

of repeat needs a

SETUNITS LINESP

command...

...so that lines

won't overlap!

This is

SETUNITS LINESP 3 IN

Chapter 7. N_UP Printing

With **N_UP** printing, which is defined in the form definition, you can print up to four pages on a sheet of paper in simplex mode and up to eight pages in duplex mode. Each of these pages are independent, allowing use of different page formats and copy groups for each page. This provides significantly more flexibility and function than the traditional multiple-up capability which is defined in the page definition. Refer to "N_UP Compared to Multiple-up" on page 170 for more differences between **N_UP** printing and multiple-up printing.

There are two levels of **N_UP**:[2]

- basic **N_UP** supported by older AFP printers: 3825, 3827, 3828, 3829, 3835, and 3900-001.
- enhanced **N_UP** supported by printers with the Advanced Function Common Control Unit (AFCCU™).

N_UP Partitions and Partition Arrangement

A key concept in **N_UP** printing is the *partition*. In both basic and enhanced **N_UP**, each sheet of paper is divided into equal size areas called partitions. Pages are placed in these partitions in sequential order in basic **N_UP**. Pages are placed in relation to one or more of these partitions in enhanced **N_UP**. Knowing the partition arrangement is critical to designing applications using **N_UP**.

Note: If you are using basic **N_UP** printing with PSF set to **DATACK=BLOCK**, data must fall within the boundary of the partition. Any data placed outside the edge of the partition boundary is not printed, and no error message is generated. However, enhanced **N_UP** printing allows pages to overlap partitions. The only limits are that the pages must not extend beyond the boundaries of the physical sheet, and the pages must not exceed the total number of **N_UP** partitions specified for the sheet.

The number, size, and position of partitions are determined by three things:

- the **N_UP** value (**1**, **2**, **3**, or **4**)
- the size and shape of the sheet of paper
- the form definition presentation options, **PRESENT** and **DIRECTION**

When printing in duplex mode, the same number of partitions is also defined for the back of the sheet. For normal duplex, back partitions are placed as if the sheet were flipped around its right side or *y-axis*. For tumble duplex, they are placed as if the sheet were flipped around its top edge, or *x-axis*. See Figure 72 on page 149 and Figure 73 on page 149 for illustrations of duplex partitions.

Figure 71 on page 148 through Figure 82 on page 154 show the partition arrangement that results from every combination of **N_UP** value, paper size, and presentation option. The hex values (X 00, X 01, X 04, X 05, X 02, X 03) indicate how the Medium Orientation Triplet (X'68') specifies the position and orientation of the medium presentation space on the physical medium.

---

[2] You must have the correct level of PPFA to generate basic or enhanced **N_UP** commands and the correct level of PSF for your operating system to drive the printer in the basic or enhanced **N_UP** mode.

Use these figures to determine how your **N_UP** application is formatted by the printer. In the figures, each equal-sized partition has a number indicating its default presentation sequence. The origin for each partition is in the same relative position as the origin point shown for the medium. This point serves as the top left corner for a page printed in the **ACROSS** (or 0°) printing direction.

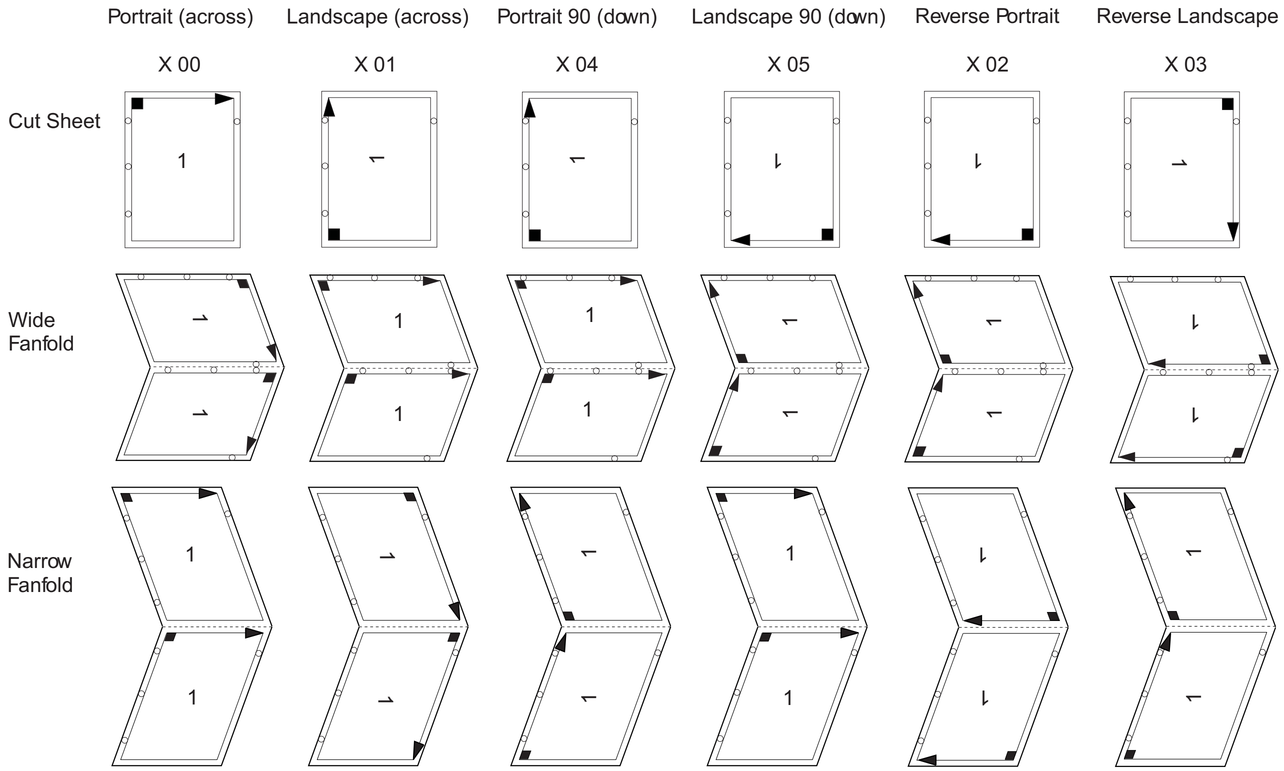


Figure 71. **N_UP 1** *Partition Numbering, Front Sheet-Side*

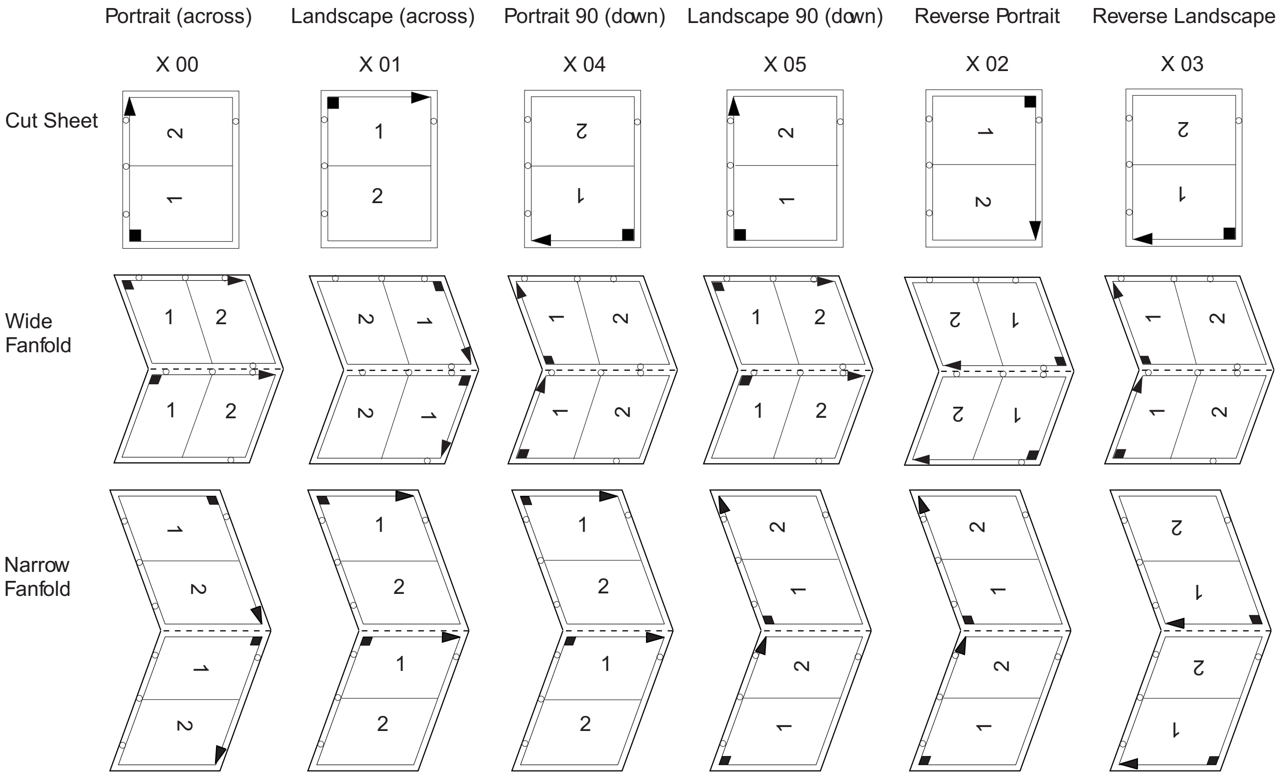


Figure 72. **N_UP 2** *Partition Numbering, Front Sheet-Side*

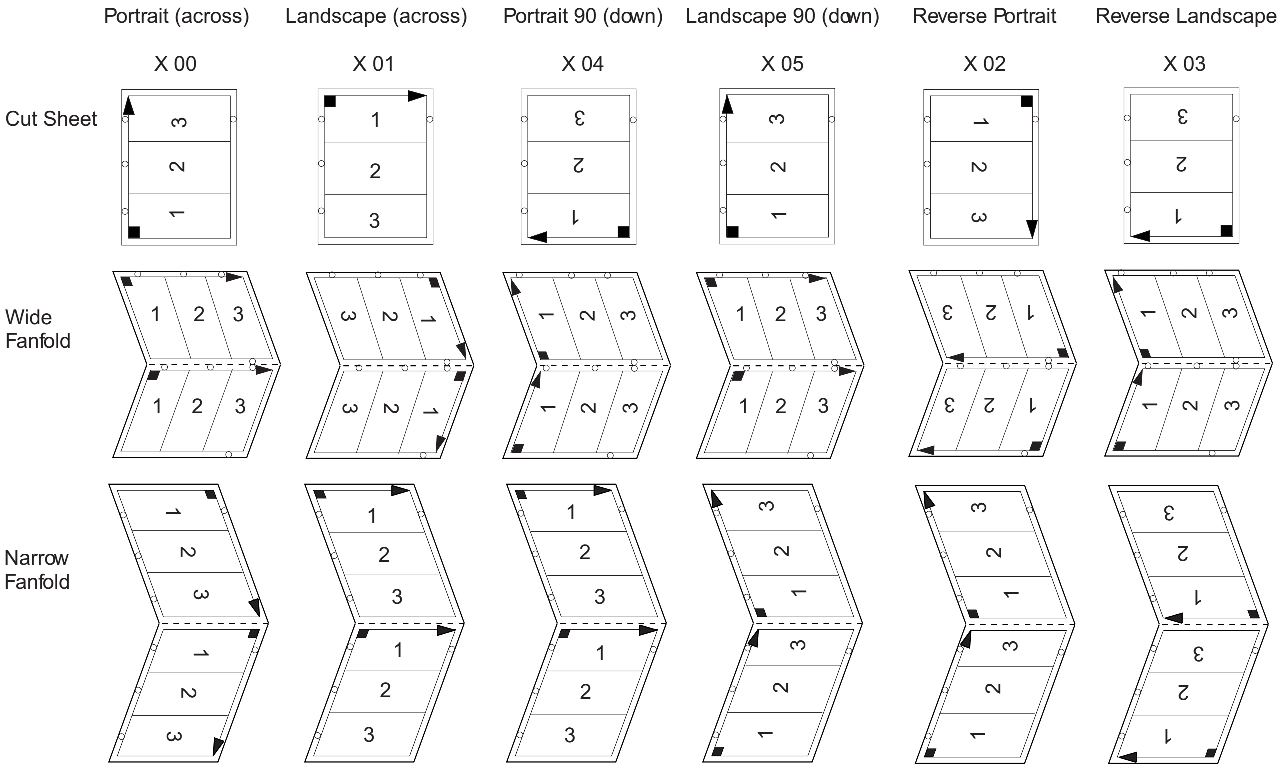


Figure 73. **N_UP 3** *Partition Numbering, Front Sheet-Side*

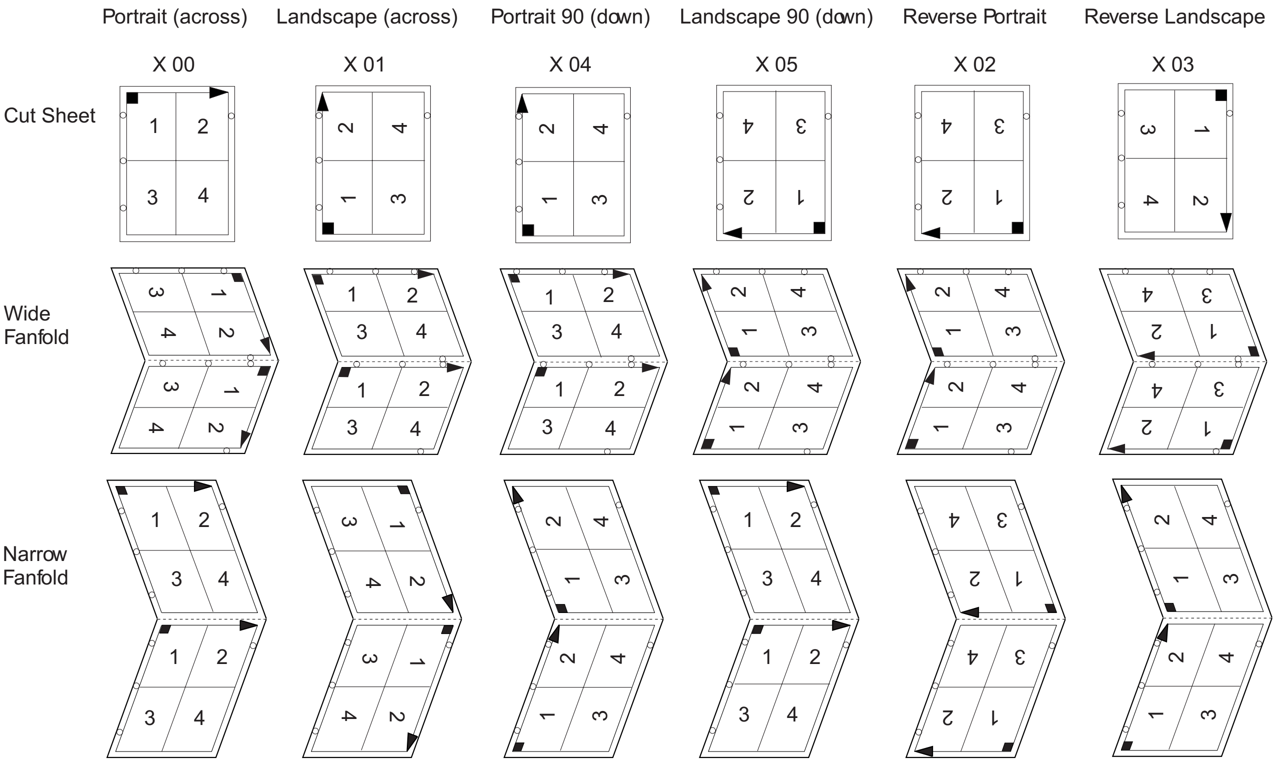


Figure 74. **N_UP 4** *Partition Numbering, Front Sheet-Side*

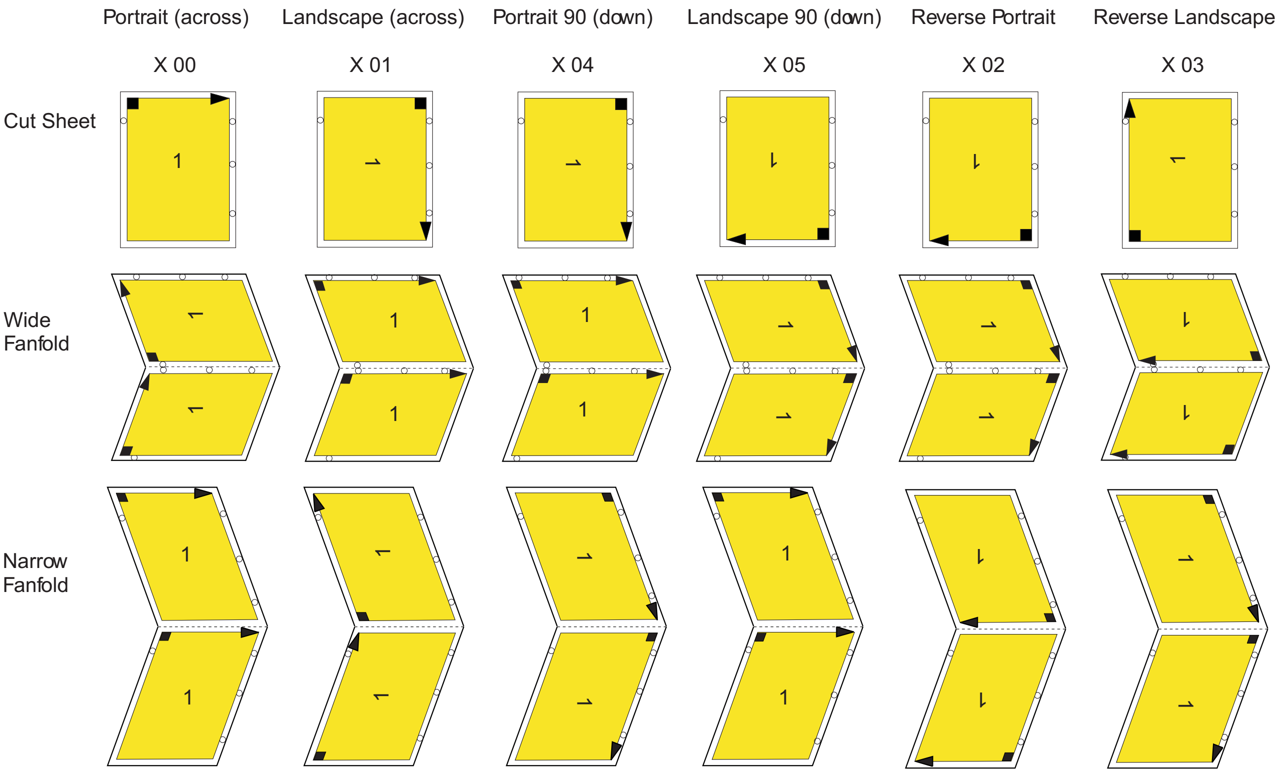


Figure 75. **N_UP 1** *Partition Numbering, Back Sheet-Side, Normal Duplex*

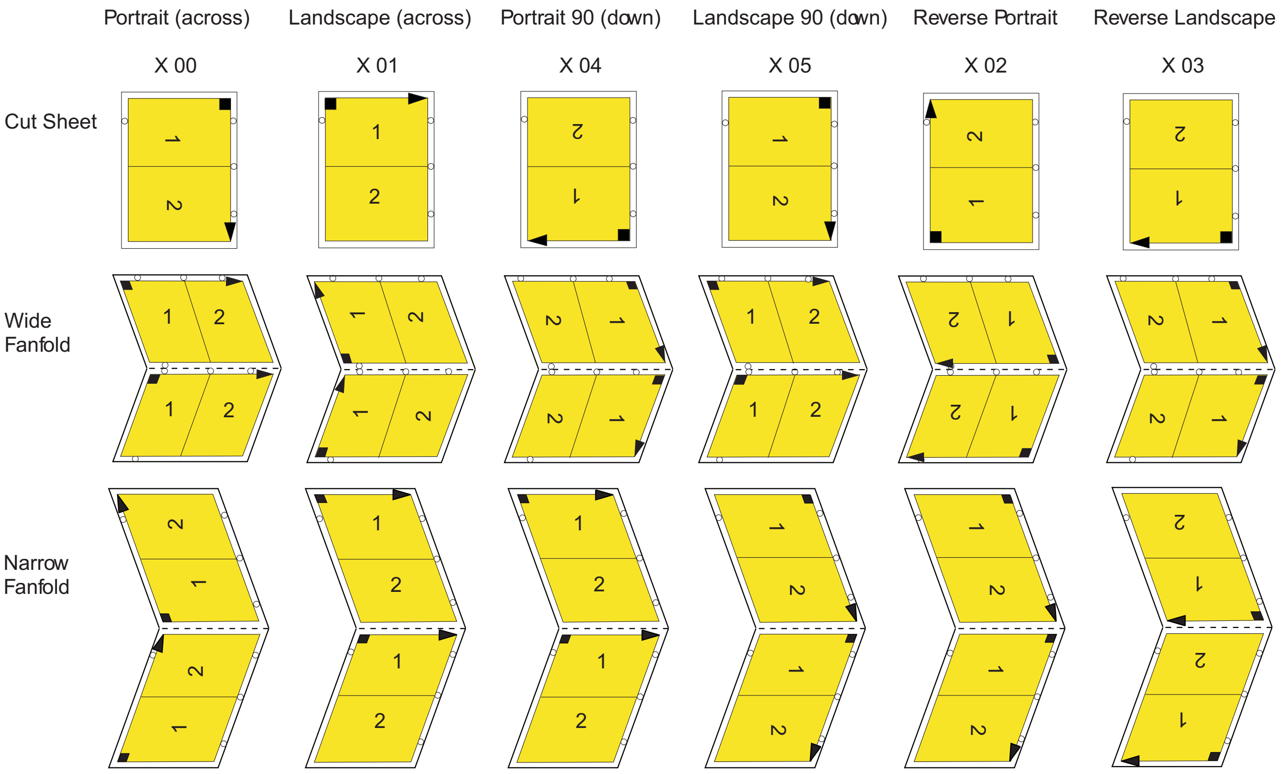


Figure 76. **N_UP 2** *Partition Numbering, Back Sheet-Side, Normal Duplex*

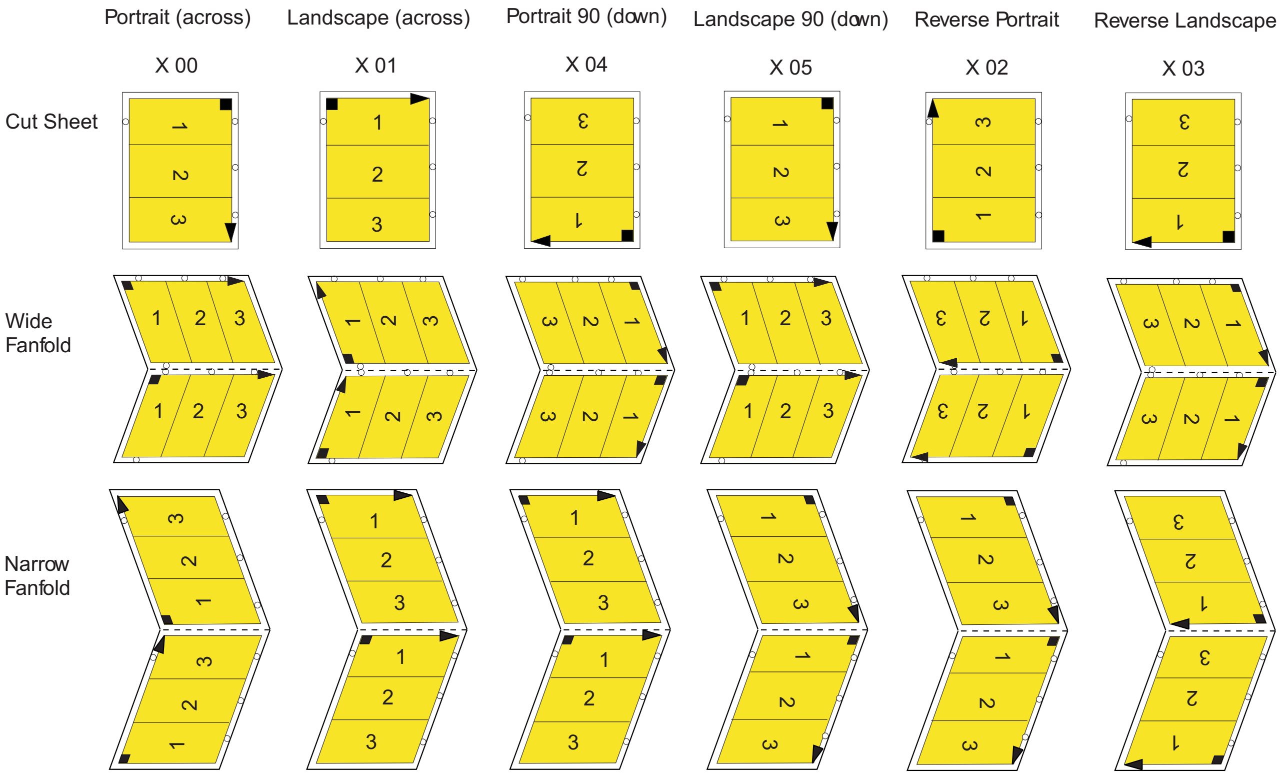


Figure 77. **N_UP 3** *Partition Numbering, Back Sheet-Side, Normal Duplex*

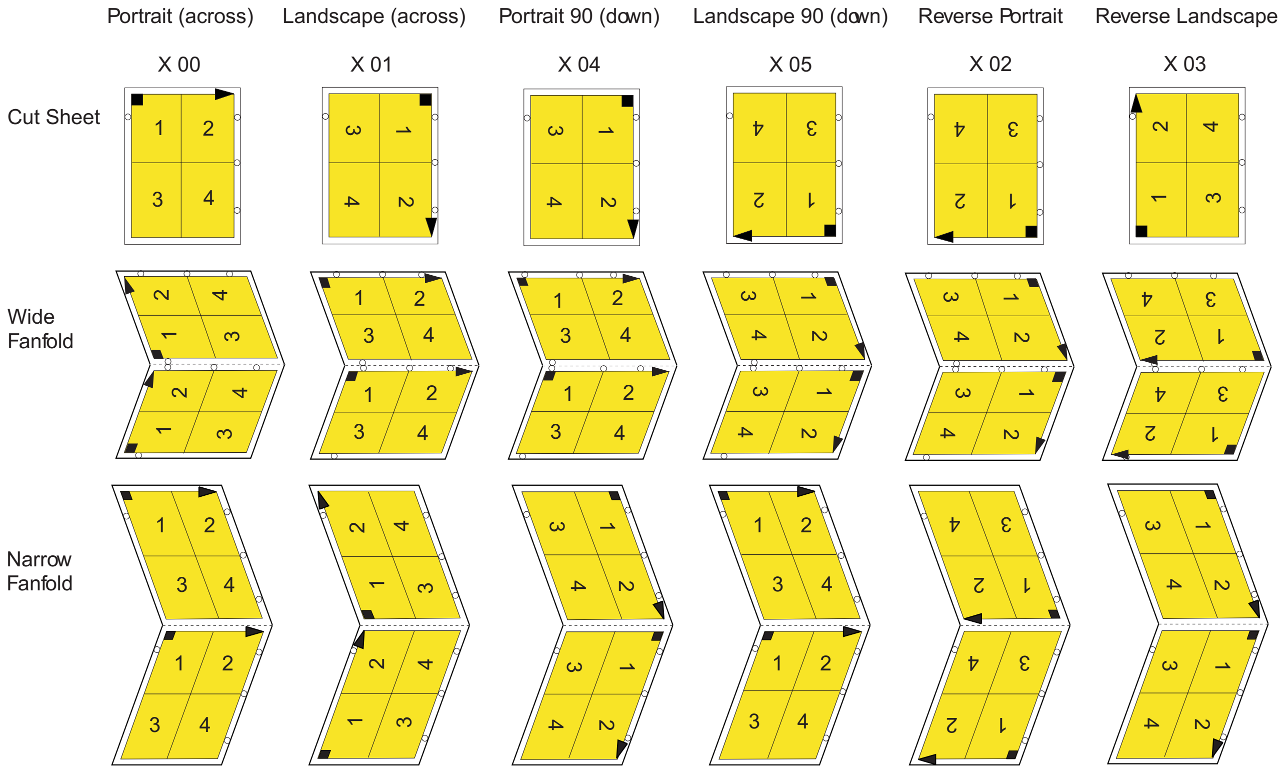


Figure 78. **N_UP 4** *Partition Numbering, Back Sheet-Side, Normal Duplex*

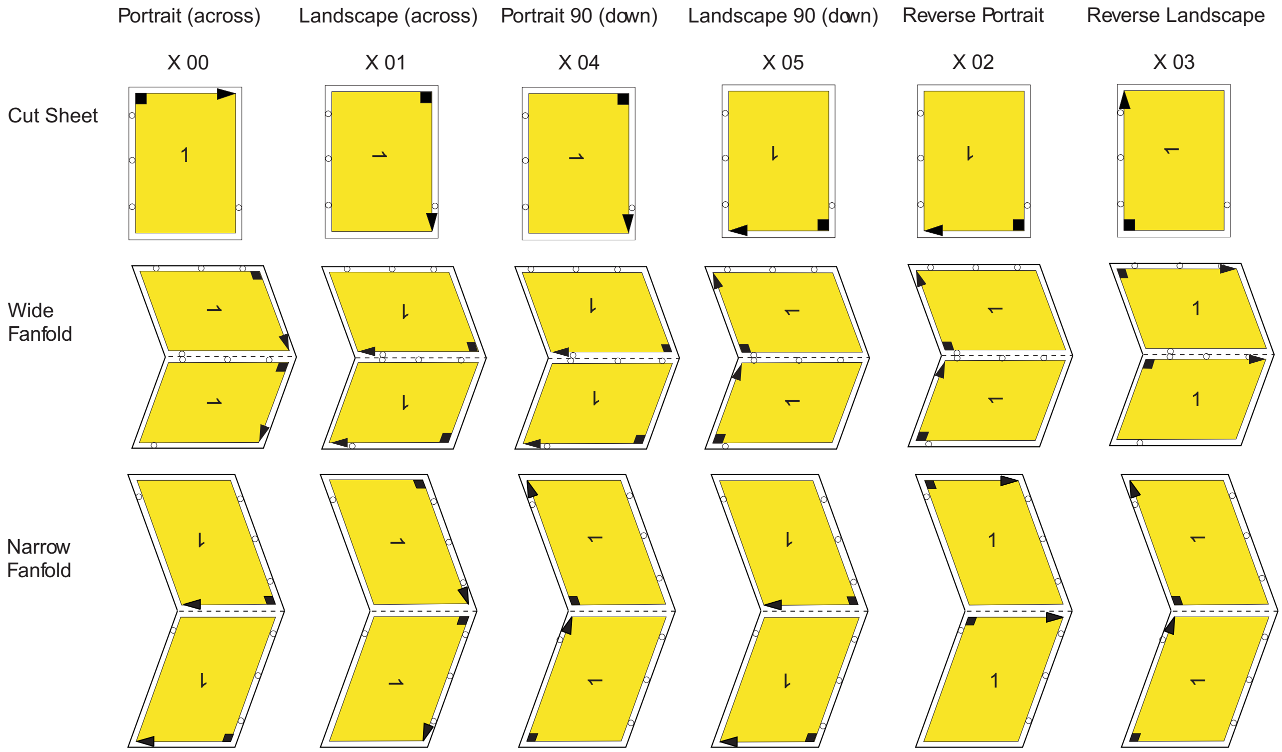


Figure 79. **N_UP 1** *Partition Numbering, Back Sheet-Side, Tumble Duplex*

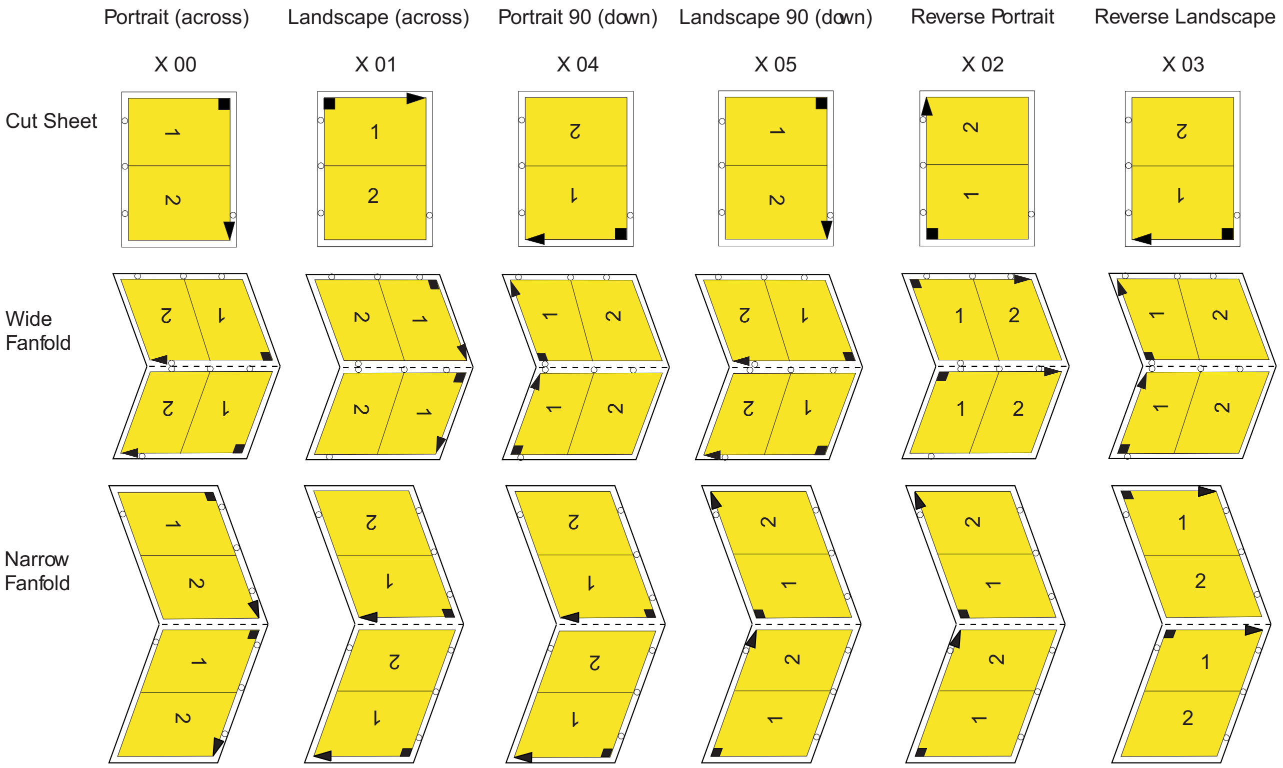


Figure 80. **N_UP 2** *Partition Numbering, Back Sheet-Side, Tumble Duplex*

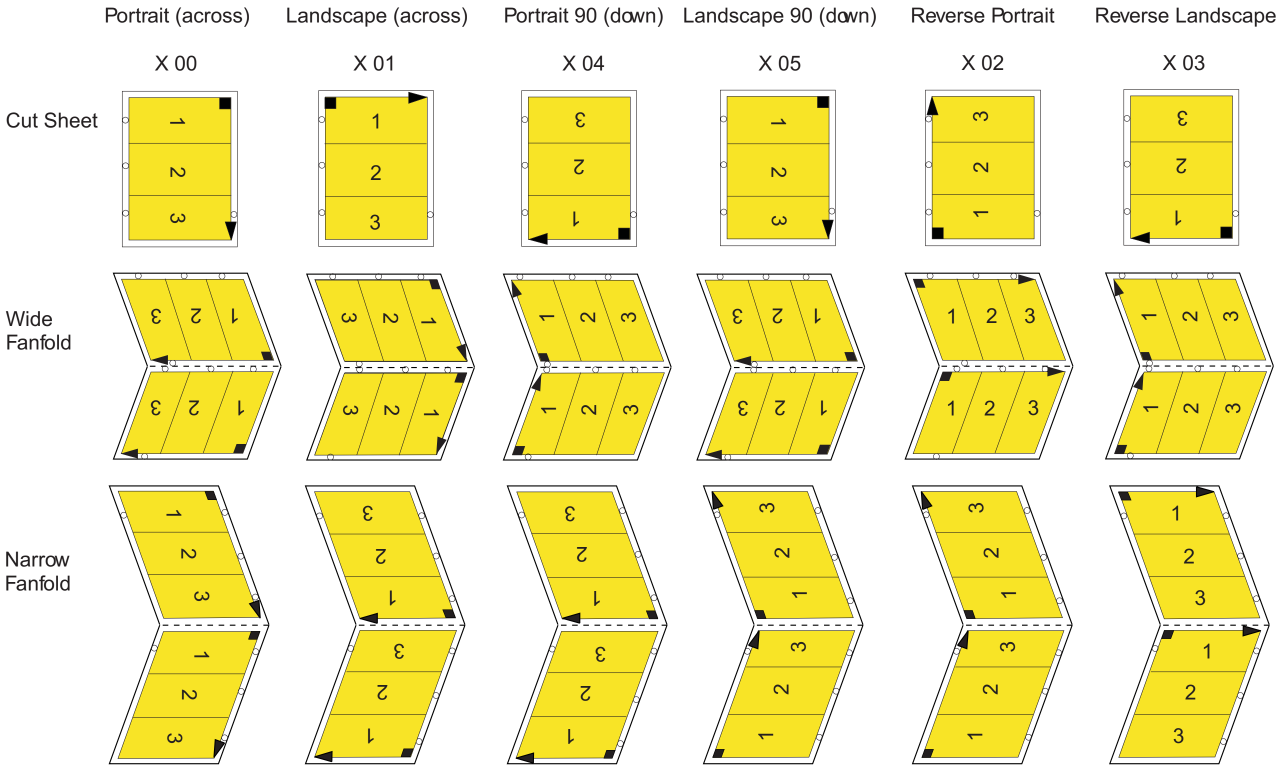


Figure 81. **N_UP 3** *Partition Numbering, Back Sheet-Side, Tumble Duplex*

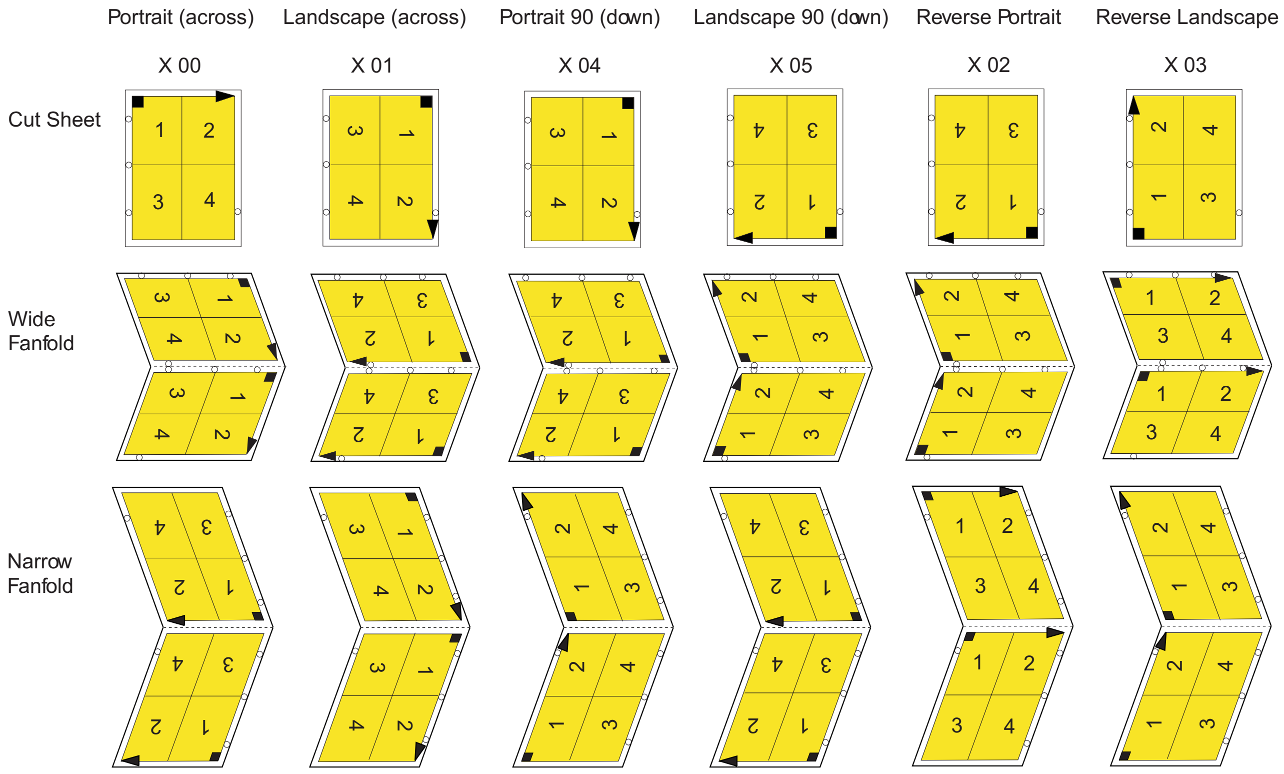
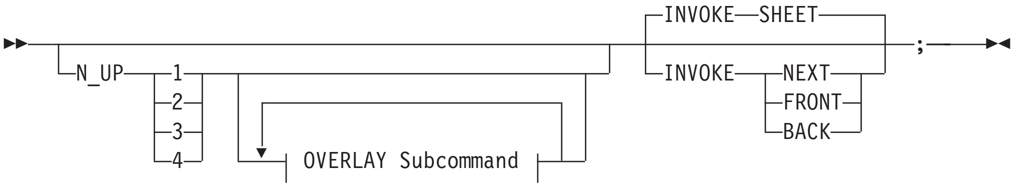


Figure 82. **N_UP 4** *Partition Numbering, Back Sheet-Side, Tumble Duplex*

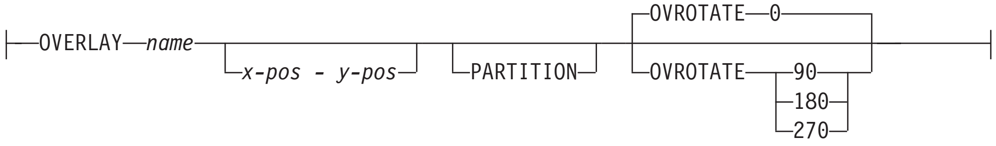
Basic N_UP Printing

You can specify the **N_UP** subcommand on either the **FORMDEF** or **COPYGROUP** commands in the form definition. Figure 83 shows the subcommands and parameters enabled with basic N_UP printing.

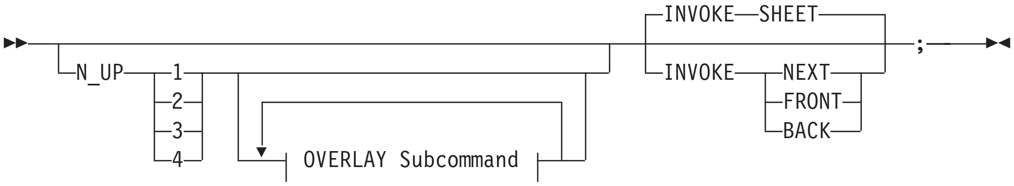
FORMDEF Subcommand



OVERLAY Subcommand:



COPYGROUP Subcommand



OVERLAY Subcommand:

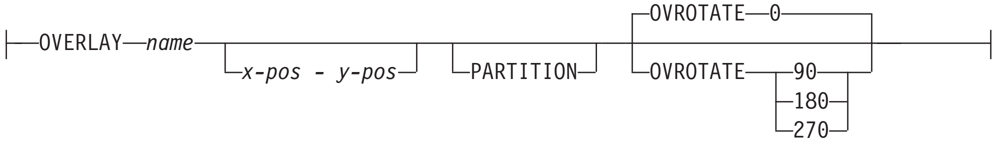


Figure 83. Subcommands for Basic **N_UP** *Printing*

The **N_UP** subcommand divides the medium into one, two, three, or four partitions, as described in "N_UP Partitions and Partition Arrangement" on page 147. The **OVERLAY** subcommand prints a page overlay in each partition at a specified offset from the page origin or the partition origin. For more information about page overlays, see "Medium Overlays and Page Overlays" on page 169.

The **INVOKE** subcommand controls the action that occurs if you invoke a new copy group. You can invoke copy groups using conditional processing in the page definition or by including an Invoke Medium Map (IMM) structured field in the print data. The default action is to eject to a new sheet. By specifying an **INVOKE** subcommand on a **COPYGROUP** command, you can instead eject to a new **N_UP** partition, which may be on the same sheet. If printing in duplex mode, you can specify whether to eject to a partition on the front or back side of the sheet.

You must use page overlays instead of medium overlays if you want to change overlays while ejecting to a new partition. PSF honors the **NEXT**, **FRONT**, and **BACK** values of the **INVOKE** subcommand only if the new copy group has the same medium modifications as the previous copy group. Medium modifications include duplexing, bin, page offset, **N_UP** values, presentation, direction, and medium overlays. If any of these modifications differ, PSF ejects to a new sheet when the copy group is invoked.

By combining **INVOKE** with the **N_UP OVERLAY** subcommand, you can place different page overlays in different partitions when you change copy groups. This is illustrated in “Basic N_UP Example 1: Using INVOKE and OVERLAY” on page 157.

The following examples show the use of basic **N_UP**. Because each example builds on the previous one, read them in sequential order to better understand basic **N_UP**. All the pages used in the examples are formatted in the **ACROSS** printing direction. Their orientation on the media is the result of using the available **PRESENT** and **DIRECTION** combinations in the **FORMDEF** command.

Basic N_UP Example 1: Using INVOKE and OVERLAY

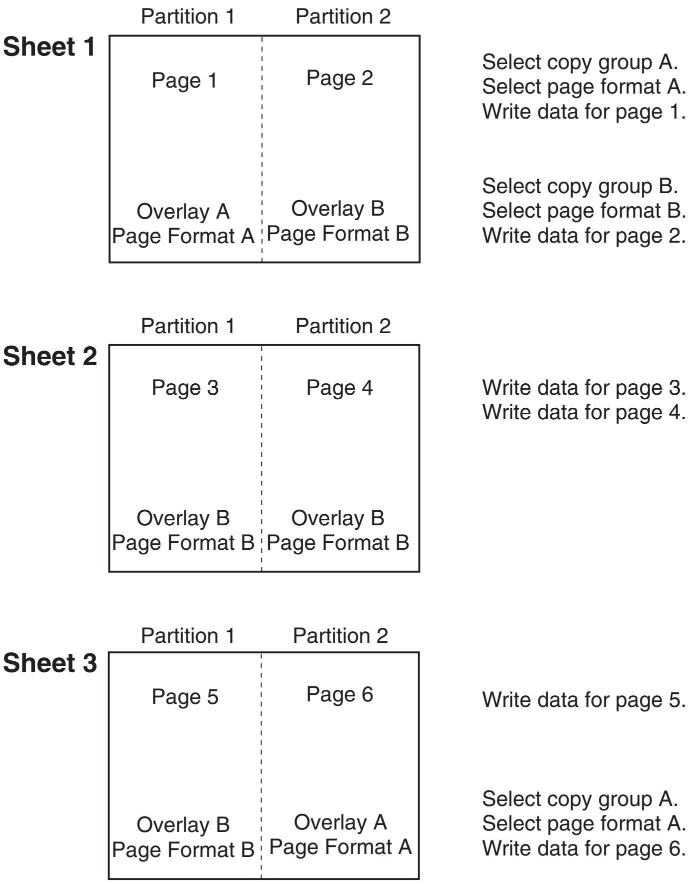


Figure 84. Basic **N_UP** *Example 1: Using* **INVOKE** *and* **OVERLAY**

```
FORMDEF TWOUPS ;

COPYGROUP A
   N_UP 2
     OVERLAY A
   INVOKE NEXT ;

COPYGROUP B
   N_UP 2
     OVERLAY B
   INVOKE NEXT ;
```

Figure 85. Form Definition for Basic **N_UP** *Example 1*

Figure 84 shows the **INVOKE** and **OVERLAY** functions of basic **N_UP** printing. Specifying **INVOKE NEXT** on the **COPYGROUP** command ensures that when the copy group is invoked by an Invoke Medium Map (IMM) structured field with conditional processing, the next page is placed in the next partition of the **N_UP** form.

The **OVERLAY** subcommand specifies a *page overlay*, which can be positioned relative to the page origin or relative to the partition origin. In basic **N_UP**, the **OVERLAY** subcommand prints the overlay with the page data in every partition on the sheet. However, as shown in this example, using **INVOKE NEXT** allows the application to use different overlays in different partitions.

Example 1 has been defined as **N_UP 2** simplex with the default **PORTRAIT ACROSS** presentation, which results in the partitions illustrated in Figure 84 on page 157. The application uses different page formats on different application pages. With **N_UP**, changing page formats ejects to the next partition, just as it ejects to a new page in applications without **N_UP**.

The application also needs different overlays on different pages. Because the overlays are specified on **N_UP** in the **COPYGROUP** subcommand, the application accomplishes this by changing copy groups. Without the **INVOKE** subcommand, changing the copy group forces an eject to a new physical sheet. However, because **INVOKE NEXT** is specified, the eject is to the next partition. Changing to copy group B after page 1 is written places page 2 in partition 2 of the same physical sheet. If the change is made after a page is placed in partition 2, the eject to the next partition is to partition 1 of the next sheet. The page is printed with the overlay specified in the new copy group.

Notes:

1. The pages in this example are line-format print data, formatted using a page definition. The example would be the same for MO:DCA data, except that page formats would not be used.
2. You can select the copy groups and page formats by including IMM and IDM structured fields in the print data or by using conditional processing in the page formats.
3. Overlays can be defined as *page overlays* in the page definition or in the form definition **N_UP** or **PLACE** subcommands. Overlays can also be defined as *medium overlays* in the form definition **SUBGROUP** command. If you want to change overlays when ejecting to a new partition, use *page overlays* instead of medium overlays. See “Medium Overlays and Page Overlays” on page 169 for information about page and medium overlays.

Basic N_UP Example 2: Normal Duplex

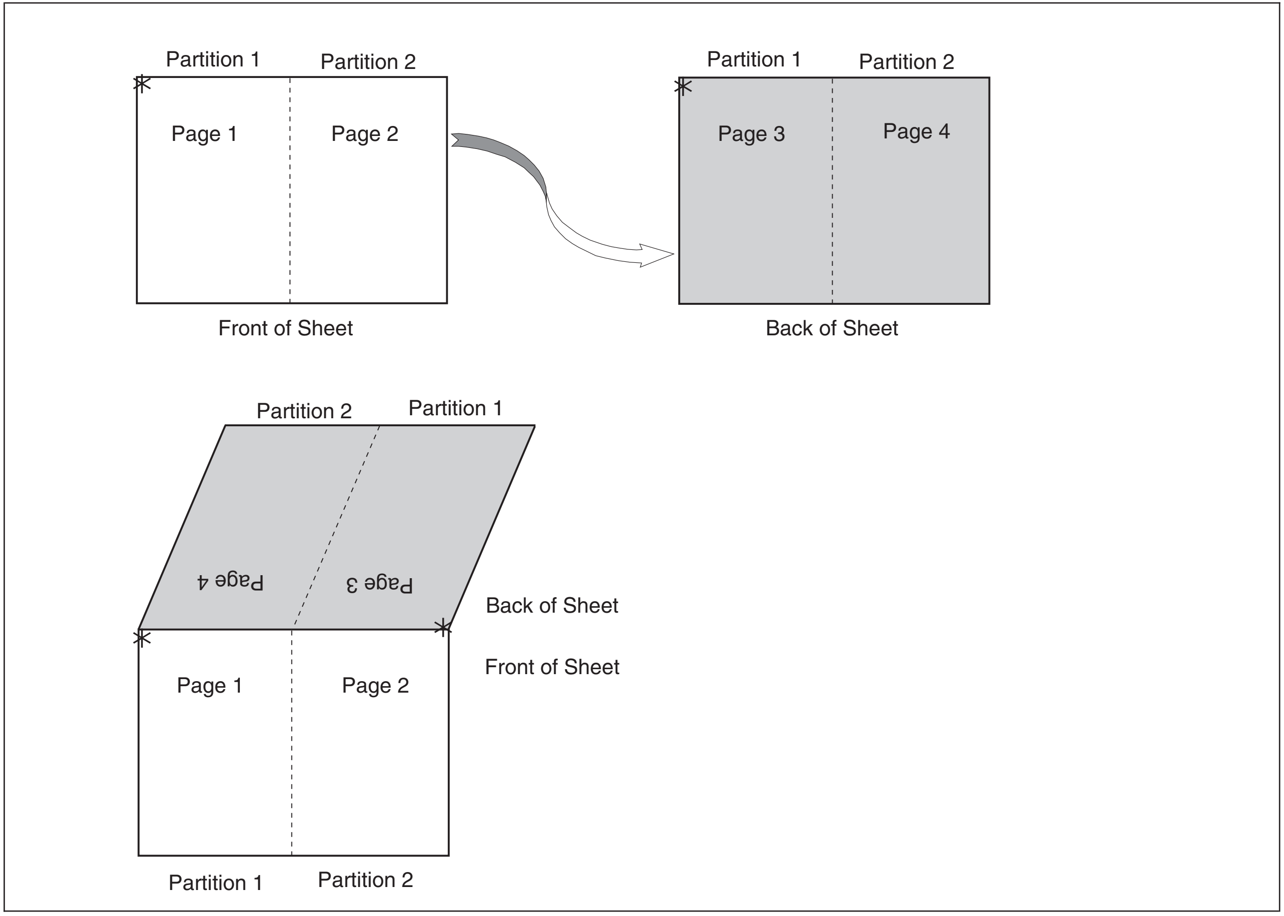


Figure 86. Basic **N_UP** *Example 2: Normal Duplex*

```
FORMDEF NUPDUP
N_UP 2
PRESENT PORTRAIT
DIRECTION ACROSS
DUPLEX NORMAL ;
```

Figure 87. Form Definition for Basic **N_UP** *Example 2: Normal Duplex*

Figure 86 shows the partition order for duplexed pages. This figure also shows the partitions into which the sheet is divided for **N_UP 2** with **PORTRAIT** presentation and **ACROSS** direction. With normal duplex, the sheet is rotated around its *y-axis*, which is the right edge of the sheet. The result is that partition 2 for the back side of the sheet is on the back of partition 1 for the front side, and page 4 is on the back of page 1. The tops of pages 3 and 4 are aligned with the tops of pages 1 and 2.

Basic N_UP 2 Example 3: Tumble Duplex

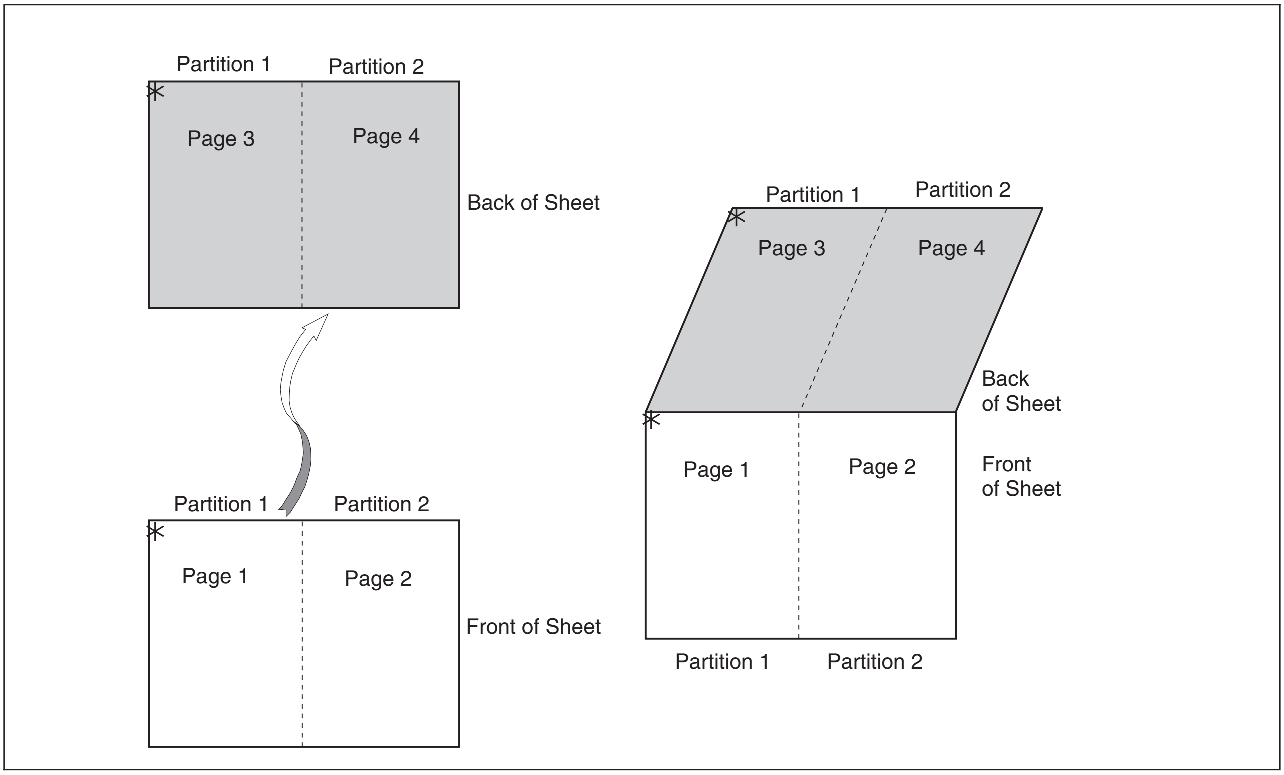


Figure 88. Basic **N_UP 2** *Example 3: Tumble Duplex*

```
FORMDEF NUPTUM
N_UP 2
PRESENT PORTRAIT
DIRECTION ACROSS
DUPLEX TUMBLE ;
```

Figure 89. Form Definition for Basic **N_UP 2** *Example 3: Tumble Duplex*

Figure 88 shows the partition order for tumble duplex pages. This figure also shows the partitions into which the sheet is divided for **N_UP 2** with **PORTRAIT** presentation and **ACROSS** direction. With tumble duplex, the sheet is rotated around its *x-axis*, which is the top of the sheet. The result is that partition 1 of the back of the sheet falls on the back of partition 1 for the front, and page 3 falls on the back of page 1. The tops of pages 3 and 4 are aligned with the bottoms of pages 1 and 2. For more information about normal and tumble duplex printing, refer to “Normal Duplex and Tumble Duplex” on page 14.

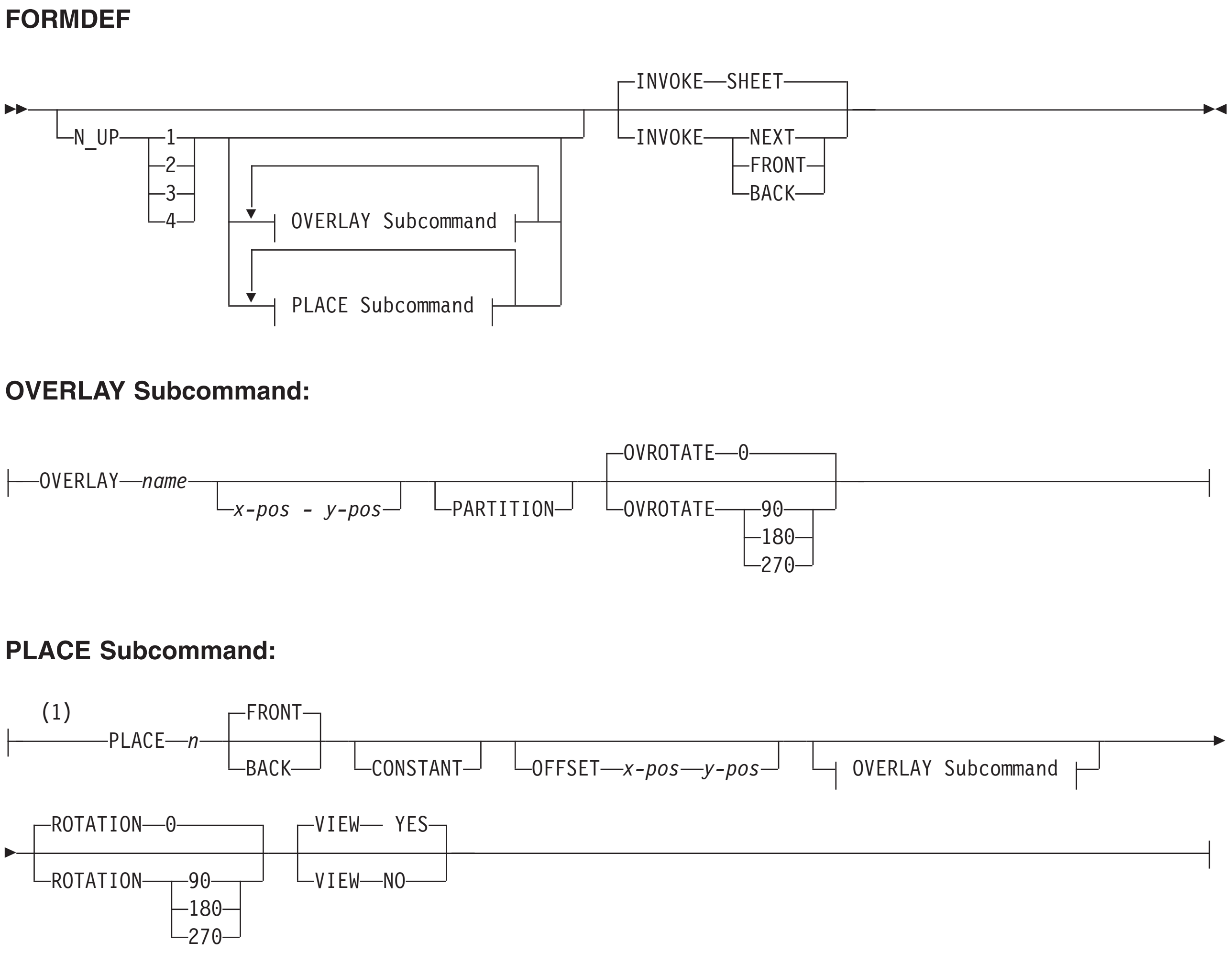
Enhanced N_UP Printing

Enhanced **N_UP** is supported on AFP continuous forms printers. In addition to all the function of basic **N_UP**, enhanced **N_UP** includes the powerful **PLACE** subcommand.

Using the **PLACE** subcommand, you can place pages in the partitions in any sequence, specify unique overlays for each page, and rotate both the page and the overlays in the partitions. You can place multiple pages in the same partition and no pages in other partitions, and you can extend pages across partition boundaries. In short, you can place pages of any size at any location on the front or back of the sheet, in any orientation. The only limits are that the pages must not extend outside the boundaries of the physical sheet, and the pages must not exceed the total number of **N_UP** partitions specified for the sheet.

You use a single **PLACE** command to place each page of data on the sheet. You must specify the same number of **PLACE** commands as the number of **N_UP** partitions for the sheet. This is required for error recovery and restart integrity. If you do not want to place as many pages as partitions, you can specify **CONSTANT** on a **PLACE** command to indicate that no data is to be placed in the partition. You can specify the **OVERLAY** subcommand with the **CONSTANT** subcommand to place overlays without user's data. The syntax diagrams in Figure 90 on page 162 and Figure 91 on page 163 show the subcommands and parameters enabled with enhanced **N_UP** printing.

For most applications, place constant overlays **before** placing data on the sheet. This is because the overlay is not actually placed until the next page of data is placed. If your application changes copy groups or runs out of pages on the sheet before reaching the constant overlay **PLACE** subcommand, the constant overlay is not printed. However, if you do not want the overlays to print in these cases, place the constant overlay after placing the page data.

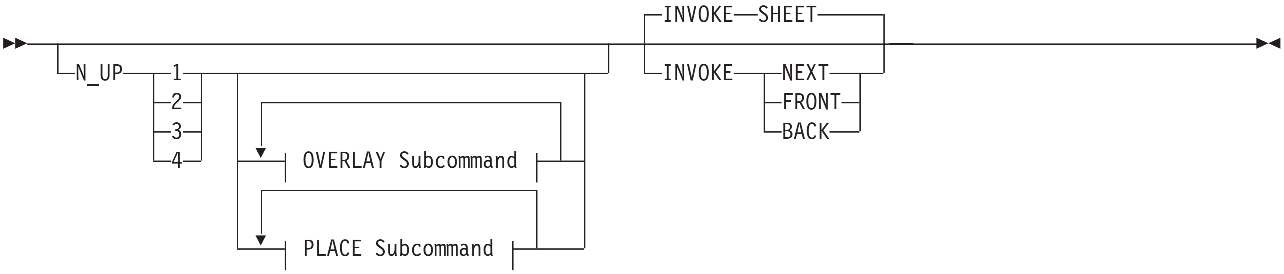


Notes:

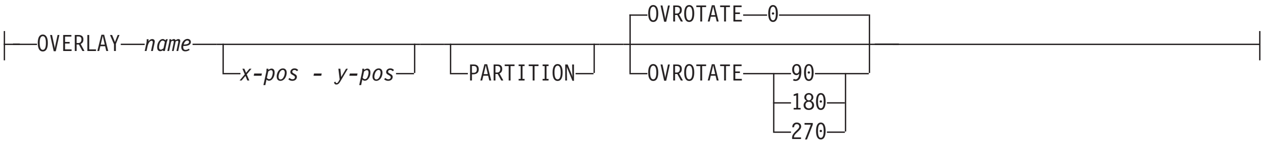
1 The use of the **PLACE** subcommand indicates enhanced **N_UP** printing.

Figure 90. **FORMDEF** *Subcommand for Enhanced* **N_UP** *Printing*

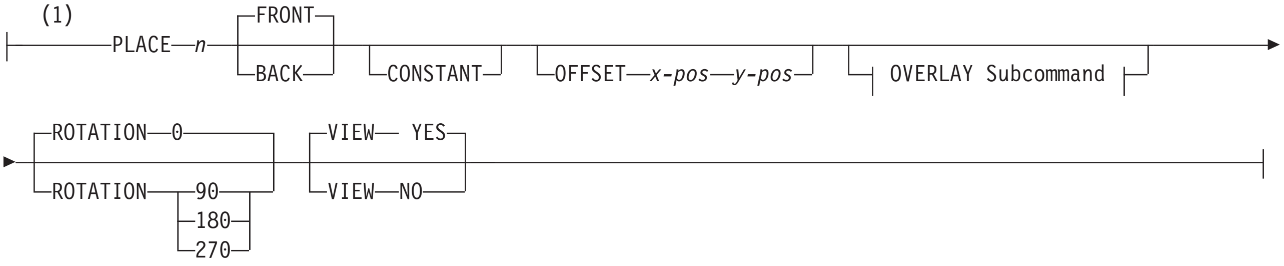
COPYGROUP



OVERLAY Subcommand:



PLACE Subcommand:



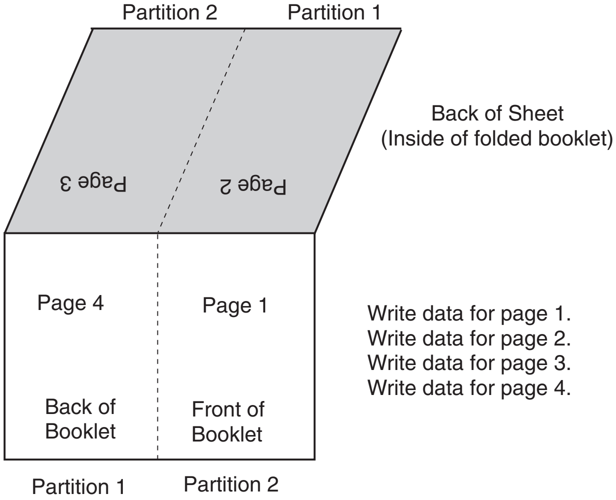
Notes:

1 The use of the **PLACE** subcommand indicates enhanced **N_UP** printing.

Figure 91. **COPYGROUP** *Subcommand for Enhanced* **N_UP** *Printing*

The following examples show enhanced **N_UP** printing. Read these examples in sequence to better understand enhanced **N_UP** printing.

Enhanced N_UP Example 1: Using PLACE



Write data for page 1.
Write data for page 2.
Write data for page 3.
Write data for page 4.

Figure 92. Enhanced **N_UP** *Example 1: Using* **PLACE**

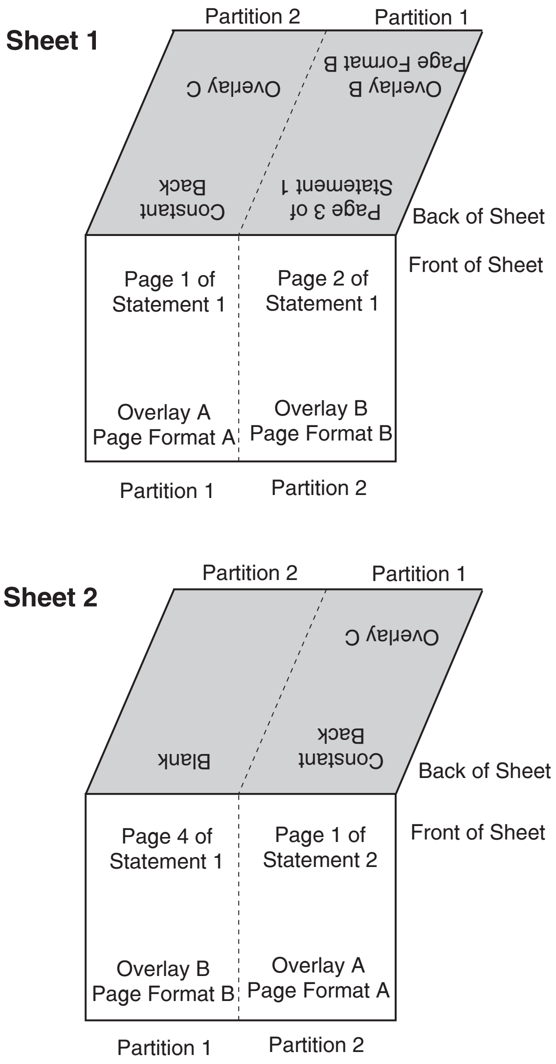
```
   FORMDEF BOOKLT DUPLEX NORMAL
       N_UP 2
 /* Page 1 */   PLACE 2 FRONT
 /* page 2 */   PLACE 1 BACK
 /* Page 3 */   PLACE 2 BACK
 /* Page 4 */   PLACE 1 FRONT ;
```

Figure 93. Form Definition for Enhanced **N_UP** *Example 1*

Figure 92 shows the function of the **PLACE** subcommand in specifying the sequence of partitions into which pages are placed. This example is **N_UP 2** duplex. The default partition sequence is from left to right. Notice that when printing in normal duplex, partition 1 on the back of the sheet aligns with partition 2 on the front of the sheet. See "Basic N_UP Example 2: Normal Duplex" on page 159 and "Basic N_UP 2 Example 3: Tumble Duplex" on page 160 for information on **N_UP** duplex partitions.

For this booklet, you do not want to print pages in the default order: partitions 1 and 2 on the front, followed by partitions 1 and 2 on the back. Instead, print the pages so that when the sheet is folded, you have a booklet, with page 1 on the front outside of the booklet, pages 2 and 3 inside the folded booklet, and page 4 on the back outside of the booklet. The form definition shown in Figure 93 uses the **PLACE** subcommand of enhanced **N_UP** to place pages in the partitions in the order needed to accomplish this. The application writes the pages in order, page 1 through page 4, and the **N_UP** form definition provides the correct sequencing in the partitions.

Enhanced N_UP Example 2: Using CONSTANT and OVERLAY



Select copy group PAGE1.
Select page format PAGE1.
Write data for page 1.

Select copy group PAGEON.
Select page format PAGEON.
Write data for page 2.
Write data for page 3.

Write data for page 4.

Select copy group PAGE1.
Select page format PAGE1.
Write data for page 1.

Figure 94. Enhanced **N_UP** *Example 2: Using* **CONSTANT** *and* **OVERLAY**

```
FORMDEF STATMT DUPLEX NORMAL ;

COPYGROUP PAGE1
  INVOKE BACK
  N_UP 2
  PLACE 2 BACK      CONSTANT OVERLAY C
  PLACE 1 FRONT     OVERLAY A
  PLACE 1 BACK      CONSTANT OVERLAY C
  PLACE 2 FRONT     OVERLAY A  ;

COPYGROUP PAGON
  INVOKE NEXT
  N_UP 2
  PLACE 1 FRONT     OVERLAY B
  PLACE 2 BACK      OVERLAY B
  PLACE 2 FRONT     OVERLAY B
  PLACE 1 BACK      OVERLAY B  ;
```

Figure 95. Form Definition for Enhanced **N_UP** *Example 2*

Figure 94 on page 165, introduces the **CONSTANT** subcommand of enhanced **N_UP** and shows the functions of the **PLACE** subcommand, which was described in “Enhanced N_UP Example 1: Using PLACE” on page 164 and the **INVOKE** subcommand, which was described in “Basic N_UP Example 1: Using INVOKE and OVERLAY” on page 157. This figure represents a user application that is printing customer statements using the values **N_UP 2** duplex. The **PLACE** subcommand places the pages in the correct order for post-processing equipment to cut the sheets into individual pages and interleave them to produce sequential pages. The **INVOKE** subcommand guarantees that one customer's statement is never printed on the back side of another customer's statement. The **N_UP 2** subcommand, combined with the default **PORTRAIT ACROSS** presentation, divides the sheet into the two partitions illustrated in Figure 94 on page 165.

In Figure 94 on page 165, page 1 of each customer's statement is printed with overlay A. The back side of page 1 is a constant overlay, with no user's data. The remaining pages of each customer's statement are printed with overlay B.

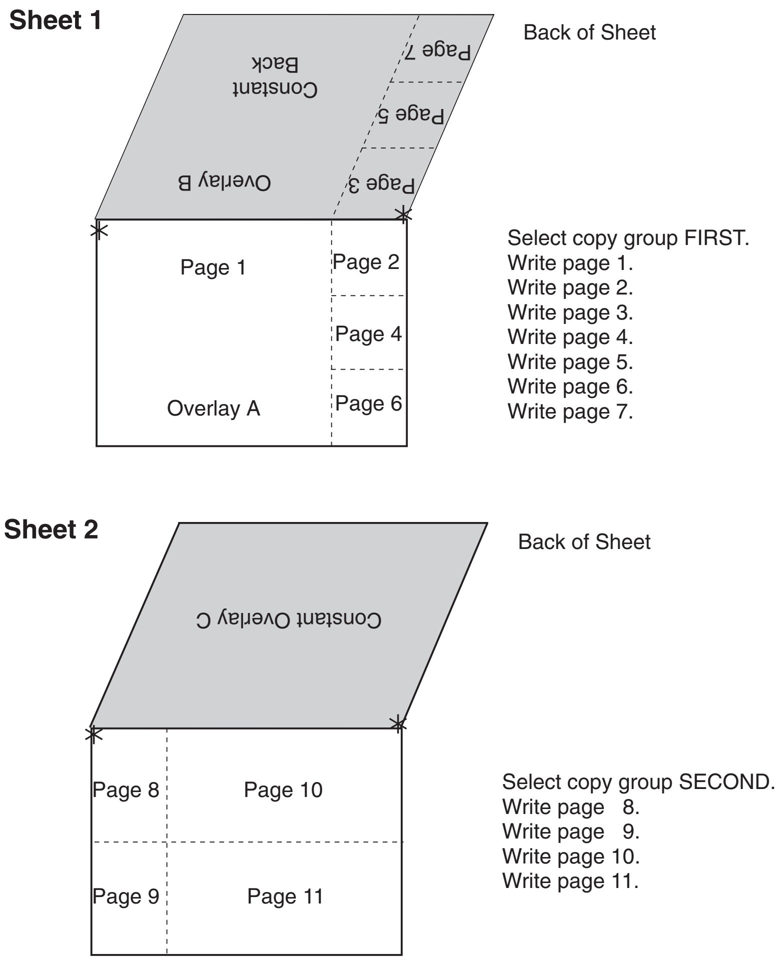
The copy groups place the required overlays on both the right and left halves of the sheet, so that a new customer statement can begin on either half of the sheet. **COPYGROUP PAGON** assigns overlay B to all partitions on the sheet. **COPYGROUP PAGE1** assigns overlay A to all front partitions and overlay C to all back partitions. The **CONSTANT** parameter used with **OVERLAY** C means that no user's data is printed in the partition with the overlay. To guarantee that the constant overlay prints whenever page 1 is printed, the **PLACE** subcommand for the constant overlay is specified before the **PLACE** subcommand for page 1 print data. The **INVOKE** subcommand specifies **BACK** to ensure that the overlay is printed on the back of the partition.

In the application shown in Figure 94 on page 165, the copy group is changed to **PAGON** after page 1 is printed. Because the constant overlay and page 1 were printed with the first two **PLACE** commands of copy group **PAGE1**, the third **PLACE** command in new copy group is used for the next page. Page 2 of statement 1 is placed in partition 2 front, as specified in the third **PLACE** subcommand of copy group **PAGON**.

After the fourth and last page of statement 1, the copy group is changed back to **PAGE1** to print page 1 of statement 2. Page 4 of statement 1 printed in front partition 1 using the first **PLACE** subcommand of copy group **PAGON**. **N_UP** selects the second **PLACE** subcommand of copy group **PAGE1**: `PLACE 1 FRONT`. But the **INVOKE** subcommand for copy group **PAGE1** specifies **BACK**. **N_UP** continues sequentially through the **PLACE** subcommands of copy group **PAGE1** until it finds a **BACK** partition. This is the third **PLACE** subcommand: `PLACE 1 BACK CONSTANT OVERLAY C`. The constant overlay is placed in partition 1 on the back of the sheet, then page 1 of the new customer's statement is printed using the next **PLACE** subcommand: `PLACE 2 FRONT` on the front side of the constant overlay.

Note: You can use **NEXT**, **FRONT**, or **BACK** on the **INVOKE** subcommand only when switching between copy groups that have identical medium modifications. This includes identical **N_UP** values and an identical number of **PLACE** subcommands. If the copy groups have different values, the **INVOKE** command causes an eject to a new physical sheet.

Enhanced N_UP Example 3: Asymmetric Pages



Select copy group FIRST.
Write page 1.
Write page 2.
Write page 3.
Write page 4.
Write page 5.
Write page 6.
Write page 7.

Select copy group SECOND.
Write page 8.
Write page 9.
Write page 10.
Write page 11.

Figure 96. Enhanced **N_UP** *Example 3: Asymmetric Pages*

Figure 96 shows the flexibility and power of enhanced **N_UP** printing. With enhanced **N_UP** printing, you can place pages relative to any partition on the sheet, front or back, in any sequence. Pages are not limited by partition boundaries. The only limitations are that pages must not print outside the physical form boundaries, and you cannot place more pages on a sheet than the number specified in the **N_UP** subcommand. For an **N_UP 4** duplex page, the limit is eight pages total on front and back sides combined. For **N_UP 3** duplex, the limit is six pages on the front and back combined.

Note: In the duplex examples in Figure 96 all of the pages can be on one side, with the other side blank.

```
  FORMDEF ASYMET DUPLEX NORMAL ;

  COPYGROUP FIRST
    PRESENT LANDSCAPE DIRECTION ACROSS
    N_UP 4
 /* Constant*/   PLACE 1 BACK  OFFSET  4  0  CONSTANT OVERLAY B
 /* Page  1 */   PLACE 1 FRONT OFFSET  0  0  Overlay A
 /* Page  2 */   PLACE 1 FRONT OFFSET 12  0
 /* Page  3 */   PLACE 1 BACK  OFFSET  0  0
 /* Page  4 */   PLACE 1 FRONT OFFSET 12  4
 /* Page  5 */   PLACE 1 BACK  OFFSET  0  4
 /* Page  6 */   PLACE 1 FRONT OFFSET 12  8
 /* Page  7 */   PLACE 1 BACK  OFFSET  0  8 ;

  COPYGROUP SECOND
    PRESENT PORTRAIT DIRECTION ACROSS
    N_UP 3
 /* Constant*/   PLACE 1 BACK  OFFSET  0  0  CONSTANT OVERLAY C
 /* Page  8 */   PLACE 1 FRONT OFFSET  0  0
 /* Page  9 */   PLACE 1 FRONT OFFSET  0  4
 /* Page 10 */   PLACE 1 FRONT OFFSET  6  0
 /* Page 11 */   PLACE 1 FRONT OFFSET  6  4
 /* 6th place */ PLACE 1 BACK  OFFSET  0  0  CONSTANT ;
```

Figure 97. Form Definition for Enhanced **N_UP** *Example 3*

To achieve the asymmetrical page placement shown in this example, place all the pages relative to the origin of partition 1 on the front or the back side of the sheet. You can place the pages relative to the origin of any of the partitions, but using partition 1 simplifies the calculations for page positions.

With **N_UP 4**, the default **PORTRAIT** presentation and **ACROSS** direction place the origin at the top right of the partition on wide, continuous-form paper. In this example, specifying **LANDSCAPE ACROSS** sets the origin at the top-left corner, to achieve the correct page arrangement.

The coding of the form definition for example 3 is shown in Figure 97. Copy group **FIRST** specifies **N_UP 4**, which requires eight **PLACE** subcommands for the duplex page. Observe that the constant overlay B on the back of the sheet represents one of the eight **PLACE** subcommands. **COPYGROUP SECOND** used for the second sheet specifies **N_UP 3**. You must use six **PLACE** subcommands. Four pages are placed on the front side, and a constant overlay is placed on the back, using five of the six **PLACE** subcommands. A **CONSTANT** page is specified without an overlay to fill the sixth **PLACE** subcommand. Nothing is printed with this **PLACE** subcommand, but it is required to ensure a correct internal page count for recovery and restart.

Note: In each copy group, the **PLACE** subcommand for the constant overlay is placed in front of all the **PLACE** subcommands for page data. This placement ensures that the constant overlay prints if any pages are printed on the sheet. Otherwise, if you change copy groups or run out of pages before the **PLACE** command for the constant overlay, the overlay does not print.

Additional N_UP Considerations

N_UP can affect the scope of other PPFA commands that operate on a page or a medium.

COPIES The **COPIES** subcommand in the **SUBGROUP** of the form definition operates on the physical medium. When you specify five copies using **N_UP 2**, you get five sheets of the **N_UP 2** data.

SUPPRESSION
The **SUPPRESSION** subcommand in the **SUBGROUP** of the form definition operates on the physical medium. The suppression names in the **SUBGROUP** operate on all **N_UP** pages on the sheet.

OVERLAY You can specify an **OVERLAY** subcommand in multiple places in the form definition and can also specify an overlay in the page definition. The result is either a *page overlay* or a *medium overlay*. See “Medium Overlays and Page Overlays” for a description of the differences between these commands and the uses of these overlays.

PRESENT DIRECTION
You use the **PRESENT** and **DIRECTION** subcommands of the form definition with the **N_UP** subcommand to determine partition arrangement. These commands, which are described in this update guide, now affect all **N_UP** printers, including cut-sheet printers.

CONDITION You can use the **CONDITION** command of the page definition with **N_UP** just as you use it with non **N_UP** jobs. However, the **NEWSIDE** and **NEWFORM** parameters may operate differently than you expect. **NEWSIDE**, which is equivalent to invoking a new page format, ejects to the next partition, which may not be on a new side of an **N_UP** sheet. **NEWFORM**, which is equivalent to invoking a new copy group, ejects to a new sheet with basic **N_UP**. The effect with enhanced **N_UP** depends on the coding of the **INVOKE** subcommand.

Medium Overlays and Page Overlays

An AFP overlay can be used as a *page overlay* or as a *medium overlay*. Different actions are performed on these two different types of overlays. Page overlays apply to the page and are placed relative to the page origin. Medium overlays always apply to the entire medium and are placed at the medium origin. When used with **N_UP**, the medium overlay still applies to the entire sheet of paper, not to the individual partitions.

The same overlay can be either a page overlay or a medium overlay, depending on the method used to invoke it for printing. An overlay invoked by a page definition or by an Include Page Overlay (IPO) structured field is always a page overlay. An overlay invoked by a form definition without **N_UP** is always a medium overlay. When **N_UP** is specified in the form definition, you can specify commands to invoke a page overlay. The examples below show the ways in which overlays can be invoked.

```
PAGEDEF EXMPL1 ;
PAGEFORMAT P2EXMPL1;
OVERLAY EXMPL1;       /* Allows this page overlay to be     */
                      /* invoked by an IPO structured field */
PRINTLINE REPEAT 60;  /* coded in the print data            */
```

Figure 98. Page Overlay Invoked by an IPO Structured Field

```
PAGEDEF EXMPL2 ;
PAGEFORMAT P2EXMPL2;
OVERLAY EXMPL2;        /* Optional. Stores overlay for reuse */
PRINTLINE REPEAT 1
  POSITION 1 IN 1 IN
  OVERLAY EXMPL2      /* Prints overlay if data prints on printline */
     -1 IN -1 IN ;    /* Positions overlay relative to printline    */
PRINTLINE REPEAT 50;
```

Figure 99. Page Overlay Invoked by a **PRINTLINE** *Command*

```
FORMDEF EXMPL3 ;
COPYGROUP F2EXMPL3
 DUPLEX NORMAL ;
 OVERLAY XMPL3F;       /* Allows SUBGROUP to invoke overlay   */
 OVERLAY XMPL3B;       /* Allows SUBGROUP to invoke overlay   */
 SUBGROUP FRONT
 OVERLAY XMPL3F;       /* Prints overlay on front of every form */
 SUBGROUP BACK
 OVERLAY XMPL3B;       /* Prints overlay on back of every form */
```

Figure 100. Medium Overlay Invoked by a Form Definition

```
FORMDEF EXMPL4 ;
COPYGROUP F2EXMPL4
 N_UP 2
 OVERLAY EXMPL4        /* Prints overlay with page in every  */
   0 0  ;              /* Partition at the page origin (0,0) */
```

Figure 101. Page Overlay in a Simple **N_UP** *Form Definition*

```
FORMDEF EXMPL5 ;
COPYGROUP F2EXMPL5
 N_UP 2
  PLACE 1
   OVERLAY XMPL51        /* Prints overlay in Partition 1     */
    0 0 PARTITION        /* Places it relative to Partition   */
  PLACE 2
   OVERLAY XMPL52        /* Prints overlay in Partition 2     */
    0 0 PARTITION ;      /* Places it relative to Partition   */
```

Figure 102. Page Overlay in an Enhanced **N_UP** *Form Definition*

N_UP Compared to Multiple-up

With the addition of the **N_UP** capability, AFP now provides two methods to format multiple application pages on a single sheet:

- **N_UP** as defined in a form definition
- Multiple-up as defined in a page definition

The multiple-up function has long been available for line-format data printed on AFP printers. Multiple-up achieves the *appearance* of multiple pages on a sheet by formatting multiple groups of print lines as a single AFP page. The output is still a single AFP page on a side of a sheet, and the entire output is formatted by a single page format. If the application pages within that sheet require different print layouts, you must design a different page format for all possible arrangements of data. For example, if one side of a 2-up sheet has ten different print layouts, you need 100 different page formats to cover all the possible combinations.

In contrast, **N_UP** enables you, for the first time in AFP, to place *multiple AFP pages* on a side of a sheet. This means that each of the **N_UP** pages can be formatted using a different page format. You can change page formats between each **N_UP** page without ejecting to a new side of the sheet. For the same example with **N_UP**, you need only ten page formats for a 2-up sheet with ten different print layouts.

N_UP also means you can place multiple pages of fully-composed AFP data (or MO:DCA data) on a single sheet. This was not possible using the multiple-up function defined in the page definition, because AFP data does not use a page definition.

Chapter 8. AFP Color Management

You can use various ways to print color data with Advanced Function Presentation (AFP). However, to implement an AFP color printing solution with full color management, you must use color management resources (CMRs). We also recommend that you install all of your color images as data objects and associate CMRs with them.

Color management resources

Color management resources (CMRs) are the foundation of color management in AFP print systems. They are AFP resources that provide all the color management information, such as ICC profiles and halftones, that an AFP system needs to process a print job and maintain consistent color from one device to another.

CMRs share some characteristics with other AFP resources, but are different in some important ways.

CMRs are similar to other AFP resources in these ways:

- CMRs can be associated with elements of a print job at various levels of the hierarchy.

  Normal hierarchy rules apply, so CMRs specified at lower levels override those at the higher level. For example, a CMR set on a data object overrides a default CMR set on a print file.
- CMRs can be included in a print job in an inline resource group and referenced in a form definition, page environment, object environment, or an include Object (IOB) structured field.

  Note: CMRs can vary in size from several hundred bytes to several megabytes. If your print job uses relatively few CMRs, including them in the print file might not have an impact on the performance of your system. However, if your print job uses more than 10 CMRs, the size of the print job can increase so much that file transfer rates and network traffic are affected.
- CMRs can be stored centrally in a resource library, so you do not need to include them in every print job. You can configure all your print servers so they can access the CMRs.
- For the print server to find CMRs, the resource library must be listed in the AFP resource search path on the print server.

CMRs are different from other AFP resources in these ways:

- You cannot copy CMRs into a resource library as you can other AFP resources.

  To store CMRs in a central resource library, you must install them using an application such as AFP Resource Installer.
- CMRs and data objects must be stored in resource libraries that have resource access tables (RATs).

  AFP Resource Installer creates the RAT when CMRs and data objects are installed. We recommend that CMRs and data objects be installed in separate resource libraries and that you store resources that do not require RATs (such as form definitions, page definitions, and overlays) in other resource libraries.

- CMRs installed in a resource library can have names longer than 8 characters, and you can use the names in the print data stream.

  These names are created when you install the CMR using AFP Resource Installer and are UTF-16BE encoded.

Types of CMRs

Different situations call for different types of CMRs. Some CMRs are created by product manufacturers so you can download and use them, while others are created by your printer or other color management software. If you have the appropriate information, you can also create CMRs yourself.

Some CMRs are used to interpret input files (similar to the function performed by ICC input profiles), while others are used to prepare the final print job output for a specific printer (similar to the function performed by ICC output profiles).

Color conversion CMR

Color conversion CMRs are used to convert colors to and from the ICC Profile Connection Space (PCS), a device-independent color space. You can use them to prepare images for color or grayscale printing.

Color conversion CMRs are an essential element of any AFP color management system because they are ICC profiles encapsulated in AFP structures. The AFP structures add information that your color management system can use, but it leaves the ICC profile unaltered.

You can use color conversion CMRs to produce consistent colors on different devices. In a color system, they help ensure that the colors on your monitor are as close as possible to those that are printed. If you move the print job to a different printer, the colors are adjusted again to match the new printer.

In a grayscale system, color conversion CMRs map colors to appropriate shades of gray to produce high-quality black and white images.

Passthrough CMRs are color conversion CMRs that indicate that no color processing should be done if the color space of the presentation device is the same as the color space of the CMR. Passthrough CMRs contain no data.

Link color conversion CMR

Link color conversion CMRs combine the processing information required to directly convert an image from the color space of an input device to the color space of the output device. Essentially, link color conversion CMRs replace a pair of color conversion CMRs.

Converting color images to and from the PCS takes a significant amount of processing resources, in part because the process includes two conversions. Link color conversion CMRs combine the two conversions and make them more efficient. The printer can use the link color conversion CMR to convert colors directly from the color space of the input device to the color space of the output device with the same color fidelity they would have if the printer did both of the conversions. As a result, link color conversion CMRs can improve system performance.

The two types of link color conversion CMRs are:

Link CMRs

Link (LK) CMRs are unique. You cannot create a link CMR yourself and you do not include references to link CMRs in your print jobs. The print system creates and uses link CMRs automatically.

If you use AFP Resource Installer, link CMRs are generated automatically when you create or install a color conversion CMR. As a result, your resource library always contains link CMRs for every combination of color conversion CMRs in audit (input) and instruction (output) processing modes. When link CMRs are created, AFP Resource Installer marks them as capturable, so the printer can save them to be used in other print jobs.

If you do not use AFP Resource Installer, your printer might create link CMRs when it processes print jobs. For example, if you send a print job to an InfoPrint 5000, the printer controller looks at the audit color conversion CMRs that are specified. Then, the print controller looks at the link CMRs that it has available to find one that combines the audit color conversion CMR with the appropriate instruction color conversion CMR. If it does not find one, the print controller creates the link CMR and uses it. The print controller might save the link CMRs that it creates, but they can be removed during normal operation; for example, if the printer runs out of storage or is shut down. If the link is removed, the printer must create a new link CMR the next time it is needed.

When a link CMR is created, the print system evaluates the conversion algorithms to and from the PCS. The system then combines the algorithms, so a data object can be converted directly from one color space to the other without actually being converted to the PCS.

Device link CMRs

Device link (DL) CMRs use an ICC device link profile to convert directly from an input color space to an output color space without reference to an audit-mode or instruction-mode CMR. An ICC device link profile is a special kind of ICC profile that is used to convert the input device color space to the color space of an output or display device. ICC device link profiles are not embedded in images.

You can create, install, and uninstall device link CMRs yourself. Device link CMRs are referenced in the MO:DCA data stream and take precedence over audit color conversion CMRs. A device link CMR specifies its own rendering intent, which is indicated in the header of the ICC device link profile. This rendering intent overrides any other rendering intent that is active.

The biggest advantage of using device link CMRs is that they preserve the black channel (K component) of the input color space when converting from CMYK to CMYK.

Halftone CMRs

Halftone CMRs carry the information that a printer uses to convert print jobs into a pattern of dots that it can put on paper. Halftone CMRs can be used with both color and grayscale print jobs.

Halftone CMRs generally specify the line screen frequency, halftone pattern, and rotation of the halftone that they carry. Device-specific halftone CMRs might also include the printer resolution.

A printer that uses AFP color management to print color or grayscale print jobs must use a halftone CMR to convert the print job into a format that the printer can reproduce in ink or toner. If a halftone CMR is not specified in the print job, the printer applies a default halftone CMR.

Note: If you send your color print jobs to an InfoPrint 5000 printer, halftones are applied by the print engine. As a result, the printer ignores halftone CMR requests.

You can associate device-specific halftone CMRs or generic halftone CMRs with print jobs:

- If you know which printer is printing the job, you can associate a device-specific halftone CMR with the print job (or with AFP resources inside the print job). The printer uses the halftone CMR that you specify.
- If you do not know which printer is printing the job, but you want to ensure that it uses a halftone CMR that has certain characteristics, such as a specific line screen frequency, you can associate a generic halftone CMR with the print job.

Because it is difficult to know which halftone CMRs should be used for the current conditions on the current printer, we recommend that you specify halftone CMRs generically and let the printer choose the most appropriate CMR that it has available.

Generic halftone CMRs

You can use generic halftone CMRs when you want to choose one or more characteristics of the halftone CMR for a print job, but you do not know exactly which halftone CMRs are available.

When a print job specifies a generic halftone CMR, the print server looks in the resource library for halftone CMRs that match the printer device type and model. If the print server finds an appropriate CMR, it sends the device-specific halftone CMR to the printer with the print job. If the print server does not find an appropriate halftone CMR, it sends the generic halftone CMR to the printer.

If a print job arrives at the printer requesting a generic halftone CMR, the printer compares the requested characteristics with the available device-specific halftone CMRs. If there is a match, the printer uses the selected device-specific halftone CMR when it processes the print job. If there is no match, the printer uses the halftone CMR whose line screen frequency value is closest to the one requested.

The Color Management Object Content Architecture™ (CMOCA™) has defined a variety of generic halftone CMRs, which cover the most common line screen frequencies and halftone types. A print server that supports CMOCA can interpret generic halftone CMRs if it has device-specific halftone CMRs available to it in a resource library. If you use AFP Resource Installer, the generic halftone CMRs are installed in every resource library that you create and populate using AFP Resource Installer.

Printers that support CMOCA should be able to interpret those generic CMRs and associate them with device-specific halftone CMRs.

Indexed CMRs

Indexed (IX) CMRs map indexed colors in the data to presentation device colors or colorant combinations.

Indexed CMRs provide rules about how to render indexed colors. Indexed CMRs apply to indexed colors that are specified by using the highlight color space. They do not apply to indexed colors found within PostScript or other non-IPDS data objects. For Indexed CMRs, both instruction and audit processing modes are valid. However, only indexed CMRs with an instruction processing mode are used; those with an audit processing mode are ignored. The tags in the indexed CMR let the

CMR use various color spaces in the descriptions. These color spaces can be grayscale, named colorants, RGB, CMYK or CIELAB.

Tone transfer curve CMRs

Tone transfer curve CMRs are used to carry tone transfer curve information for an AFP print job, so you can modify the values of a particular color component and adjust the appearance of some of the colors by increasing or decreasing the amount of ink used to emphasize or reduce the effects of dot gain on the final output.

Like halftone CMRs, tone transfer curve CMRs are associated with print jobs specifically or generically. If they are specified generically, the print server looks in the resource library for tone transfer curve CMRs that match the printer device type and model. If the print server finds an appropriate CMR, it sends the device-specific tone transfer curve CMR to the printer with the print job. If the print server does not find an appropriate tone transfer curve CMR, it sends the generic tone transfer curve CMR to the printer.

If a print job arrives at the printer requesting a generic tone transfer curve CMR, the printer compares the requested characteristics with the device-specific tone transfer curve CMRs that it has available. If there is a match, the print server or printer uses the selected device-specific tone transfer curve CMR when it processes the print job. If the printer cannot find a good match for the generic tone transfer curve CMR, it ignores the request and uses its default tone transfer curve CMR.

The Color Management Object Content Architecture (CMOCA) defines several generic tone transfer curve CMRs with different appearance values. The appearance values let you specify how to print your job with regard to the reported dot gain of the printer.

Generic tone transfer curves can be used to select these appearance values:

- **Dark**

  The output is adjusted to show a dot gain of 33% for a 50% dot.
- **Accutone**

  The output is adjusted to show a dot gain of 22% for a 50% dot.
- **Highlight Midtone**

  The output is adjusted to show a dot gain of 14% for a 50% dot. This appearance might be used to emphasize the brightest part of an image.
- **Standard**

  The output is adjusted just enough to account for the effects of dot gain, effectively counteracting the dot gain.

If you use AFP Resource Installer, it installs the generic tone transfer curve CMRs on your system automatically.

CMR processing modes

CMR processing modes tell the print system how to apply a CMR to the print data it is associated with. You specify a CMR processing mode whenever you specify a CMR, although not all modes are valid for all CMR types.

Audit processing mode

CMRs with the audit processing mode refer to processing that has already been applied to a resource. In most cases, audit CMRs describe input data and are similar to ICC input profiles.

The audit processing mode is used primarily with color conversion CMRs. In audit processing mode, those CMRs indicate which ICC profile must be applied to convert the data into the Profile Connection Space (PCS).

For example, to take a photograph with a digital camera and then include the photograph in an AFP print job, you can use AFP Resource Installer to:

1. Create a color conversion CMR using the ICC profile of your camera.
2. Install your photograph in a resource library.
3. Associate the color conversion CMR with the data object, indicating the audit processing mode.

Then, you create a print job that includes the data object. When processing the print job, the system uses the color conversion CMR to convert the colors in the image into the PCS. The colors can then be converted into the color space of the printer that is printing it.

Instruction processing mode

CMRs with the instruction processing mode refer to processing that is done to prepare the resource for a specific printer using a certain paper or another device. Generally, instruction CMRs refer to output data and are similar to ICC output profiles.

The instruction processing mode is used with color conversion, tone transfer curve, and halftone CMRs. In instruction processing mode, these CMRs indicate how the system must convert a resource so it prints correctly on the target printer. The manufacturer of your printer should provide ICC profiles or a variety of CMRs that you can use. Those ICC profiles and CMRs might be installed in the printer controller, included with the printer on a CD, or available for download from the manufacturer's Web site.

If you send a color AFP print job to a printer that supports AFP Color Management, color conversion and tone transfer curve CMRs in instruction processing mode can be associated with the job. When the printer processes the print job, it applies the CMRs in this order:

1. Color conversion CMRs in audit processing mode, to convert the resources into the ICC Profile Connection Space (PCS)
2. Color conversion and tone transfer curve CMRs in instruction processing mode, to convert the resources into the color space of the printer
3. Halftone CMR in instruction processing mode, to convert the job pages from their digital format into the pattern of dots that the printer can produce

In some cases, CMRs that are usually used as instruction CMRs can be used as audit CMRs. For example, if you send a very large print job to a high-speed printer, the images in the print job are converted into the color space of that printer using a color conversion CMR with the instruction processing mode. However, if you have to reprint part of the job on a different printer, the system must convert the print job into the color space of the second printer. In that case, the color conversion CMR of the first printer is used in the audit processing mode to move the images back into the PCS. Then, the system uses a color conversion CMR of the second printer in instruction mode to convert the images into its color space.

Link processing mode

CMRs with the link processing mode are used to link an input color space in the presentation data (sometimes defined by an audit CMR) to the output color space of the presentation device (sometimes defined by an instruction CMR). Only link (LK) and device link (DL) CMRs can be used in link processing mode.

Whenever you install or uninstall audit or instruction color conversion CMRs in your resource library by using AFP Resource Installer or a similar software product, the AFP Resource Installer automatically creates or deletes link (LK) CMRs for every combination of audit and instruction color conversion CMR.

When a print job calls for a given audit-instruction combination, the print server checks the resource library for a link (LK) CMR for that combination. If the print server finds an appropriate link CMR, it sends the CMR to the printer with the print job. Your printer can use the link (LK) CMRs whenever a print job indicates that it uses a particular combination of audit and instruction CMRs.

If you do not use AFP Resource Installer or a similar program to install your resources, your color printer must either create link (LK) CMRs while it processes your print jobs or convert the colors in your jobs twice, first from the original color space to the PCS and then from the PCS to the color space of the printer.

CMR creation and installation

Device manufacturers and groups that support AFP color standards create CMRs that you can use in your color printing systems. You can also create CMRs yourself, based on your needs.

The AFP Consortium, the group that defined the AFP Color Management Object Content Architecture (CMOCA), identified a set of color conversion CMRs that are most often used in audit processing mode. The set includes color conversion CMRs for common color spaces, such as:

- Adobe® RGB (1998)
- sRGB
- SMPTE-C RGB
- SWOP CMYK

The standard CMRs are included with AFP Resource Installer, although they are not installed by default. You can install the standard CMRs that you plan to use. In addition, AFP Resource Installer automatically installs all the generic halftone and tone transfer curve CMRs in any resource library you create.

You can download device-specific CMRs for InfoPrint printers such as the InfoPrint 5000 from the InfoPrint Solutions Company Web site:

http://www.infoprint.com

If you need more CMRs, you can create them using wizards provided in AFP Resource Installer. See online help for details about the wizard.

If you use AFP Resource Installer to create a CMR, the software automatically installs the CMR in a resource library. You can also use AFP Resource Installer to install CMRs that you get from your printer manufacturer.

Data objects

Presentation data objects contain a single type of data (such as GIF, JPEG, PNG, and TIFF images) and can be used in your print jobs. These data objects can be placed directly in a page or overlay or can be defined as resources and included in pages or overlays. Using a data object as a resource is more efficient when that object appears more than once in a print job; resources are downloaded to the printer just once and referenced as needed.

Data objects can either be included inline with a print job or installed in a resource library using software such as AFP Resource Installer. If you install your data objects in a resource library, you can associate color conversion CMRs with them.

See “Resource library management” on page 182 for more information about characteristics of resource libraries.

Types of data objects

Image data objects can be stored in a number of different formats, including AFPC JPEG Subset, EPS, GIF, IOCA, PDF, PNG, and TIFF. These image types are device-independent so they can be used by different systems and still be interpreted consistently.

- AFPC JPEG Subset (JPEG)

  AFPC (AFP Consortium) JPEG Subset files, formerly called JPEG File Interchange Format (JFIF) files, are bitmap image files that are compressed by using Joint Photographic Experts Group (JPEG) compression. As a result, AFPC JPEG Subset files are most commonly referred to as JPEG files. JPEG files most commonly use the file extension .jpg, but can also use .jpeg, .jpe, .jfif, and .jif.

  JPEG compression deletes information that it considers unnecessary from images when it converts them. JPEG files vary from having small amounts of compression to having large amounts of compression. The more an image is compressed, the more information is lost. If the image is compressed only once, there usually is no noticeable effect on the image. However, if the image is compressed and decompressed repeatedly, the effects of deleting information become more noticeable.

  JPEG compression is commonly used for photographs, especially photographs that are transmitted or displayed on web pages. The compression makes the files small enough to transmit on a network efficiently, but leaves enough information that the image is still visually appealing.

- Encapsulated PostScript® (EPS)

  EPS is a PostScript graphics file format that follows conventions that Adobe Systems defined. EPS files support embedded ICC profiles.

- Graphics Interchange Format (GIF)

  GIF files are bitmap image files that are limited to a palette of 256 RGB colors. Because of the limited color range that it can contain, GIF is not a good format for reproducing photographs, but it is generally adequate for logos or charts. GIF images are widely used on the Internet because they are usually smaller than other image formats. GIF files use the file extension .gif.

- Image Object Content Architecture (IOCA)

  IOCA is an architecture that provides a consistent way to represent images, including conventions and directions for processing and exchanging image information. The architecture defines image information independently of all data objects and environments in which it might exist and uses self-identifying terms; each field contains a description of itself along with its contents.

- Portable Document Format (PDF)

  PDF is a standard file format that Adobe Systems developed.

  PDF files can be used and stored on various operating systems and contain all the required image and font data. Design attributes in a PDF are kept in a single compressed package.

  Note: Single-page and multiple-page PDF files can be used as data objects in AFP print jobs.
- Portable Network Graphics (PNG)

  PDF is a standard file format that Adobe Systems developed.

  PNG files are bitmap image files that support indexed colors, palette-based images with 24-bit RGB or 32-bit RGBA colors, grayscale images, an optional alpha channel, and lossless compression. PNG is used for transferring images on the Internet, but not for print graphics. PNG files use the file extension .png..
- Tagged Image File Format (TIFF)

  TIFF files are bitmap image files that include headers to provide more information about the image.

  TIFF files use the file extensions .tif or .tiff. TIFF files support embedded ICC profiles. If an ICC profile is embedded in a file, the characteristics of the input color space are known whenever the file is used; however, the profiles increase the file size. When you save a file in the TIFF format, you can use various compression algorithms.

  Note: Single-image and multiple-image TIFF files can be used as data objects in AFP print jobs.

Not all printers support all types of data objects.

The embedded ICC profiles in EPS, JPEG, and TIFF files contain the information that a printer uses to convert colors in the image from an input color space into the Profile Connection Space (PCS). The input color space might be an industry-standard space or it can describe the color reproduction capabilities of a device, such as a scanner, digital camera, monitor, or printer.

Data object creation and installation

You can use a wide variety of software applications to create or manipulate images to include in print jobs. If you want to store them in central resource repositories, you can use AFP Resource Installer to install them.

Data object creation

Most types of data objects are images of some kind. They might be photographs taken using a digital camera, charts or diagrams generated by a software tool, or digital drawings created using graphics software. Regardless of how images are created, you generally need to manipulate them to include them in print jobs.

The changes include:

- Convert the image into a file type that is appropriate for printing. For example, the file types that many graphics applications (such as Adobe Illustrator, CorelDRAW, and Corel Paint Shop Pro) use to store images while you work on them are not appropriate for printing. To use images that you create using any of those programs, you can save or export those files as a different file type, such as EPS, JPEG, or TIFF.

- Make sure that your image files are associated with an appropriate color space or input profile. Follow the instructions provided with your graphics software to set up color management, including installing and using ICC profiles for digital cameras and monitors, and customizing color management settings. The instructions should also explain how to change the color profile that an image uses and how to save an image with an embedded profile.
- Follow the tips and best practices provided in the other sections below for creating images and managing them as data object resources.

Data object installation

You can use AFP Resource Installer to install your images in a resource library. AFP Resource Installer includes wizards that can guide you through the process of installing an image as a data object. When you install a EPS, JPEG, or TIFF image with an embedded ICC profile using AFP Resource Installer, you can choose how you want to handle the profile:

- Leave the profile in the file without creating a CMR.
- Leave the profile in the file, but also copy the profile and create a CMR from the copy. Associate the new CMR with the data object.
- Remove the profile from the file (to reduce the file size) and make the profile into a CMR. Associate the new CMR with the data object.

Resource library management

If you store CMRs and data objects in central resource libraries, you must understand some of the characteristics of resource libraries to make sure that your resources are available when and where you need them.

Resource libraries that AFP Resource Installer creates use a resource access table (RAT) as the index of the resource library. The index is stored as a file in the library that it refers to. You must store CMRs in resource libraries that use a RAT. We recommend that you store data objects in resource libraries that use a RAT as well.

When you use AFP Resource Installer to create a resource library, it creates a RAT and stores it in the library. When you install a CMR or data object, AFP Resource Installer updates the RAT with information about the resource. When a print server looks in a resource library for a resource, it first looks in the RAT to see if the resource is listed.

The print server relies on the RAT; if it is incorrect, the print server cannot find resources in the resource library. As a result, you must always use AFP Resource Installer to manage your resource libraries, including to:

- Add CMRs and data objects to a resource library.

  Do not copy CMRs or data objects directly into the resource libraries that AFP Resource Installer uses. If you copy CMRs or data objects into these resource libraries, the RAT is not updated so the print server cannot use it to find the CMRs or data objects.
- Modify properties of data objects and CMRs listed in the RAT.

  Do not directly edit the RAT or any of the files in a resource library. Do not replace an existing version of a CMR or data object with a new version by copying the new version directly into the resource library; use AFP Resource Installer to update the resource.
- Install CMRs or data objects in a different resource library or replicate a resource library in a different location.

Do not copy CMRs or data objects from a resource library and store them in another location.

For more information on completing these tasks, see AFP Resource Installer help system.

Tips and best practices

The following general guidelines about creating and managing images and other color resources can improve the performance of your AFP color printing system.

Tips for images

To optimize the performance of your AFP color printing system, we recommend that you follow some guidelines for creating and including images in print jobs.

When you want to use color images in your print jobs:

- Get the original electronic versions of images instead of scanning existing documents.

  Almost unnoticeable specks of color in the background of images that have been scanned can greatly increase the size of the image. If you must scan an image, use an image editing tool to clean up the background as much as possible.
- Save all images in the same standard color space so you only need one input profile for all of them.

  Adobe RGB (1998) is the recommended color space for images that are to be printed.
- Flatten multi-layer images (such as the ones you can create in graphics tools like Adobe Illustrator and Corel Paint Shop Pro) before including them in print jobs.

  Unflattened images are extremely large and more difficult to work with. Save a copy of the original image for future editing, but flatten the version that you include in your print job.

Tips for resources

To optimize the performance of your AFP color printing system, we recommend that you follow some guidelines for managing color resources.

You can use AFP Resource Installer to:

- Install all the CMRs for your printer in a resource library.
- Install the data objects that you use frequently in a resource library.
- Mark the CMRs and data objects that are reused regularly as non-private, capturable resources so they can be saved on the printer and used for other print jobs without being downloaded every time.

  Note: This option is not advisable for secure resources, such as signature files.
- Install CMRs and data objects in resource libraries that the print server can access, so they only need to be stored in one place and can be used by all print servers.
- Associate audit color conversion CMRs with data objects that require color management, so the embedded profiles can be removed from the image files.

CMRTAGFIDELITY Subcommand (FORMDEF)

The following subcommand on the **FORMDEF** command describes the exception, continuation and reporting rules for Color Management Resource (CMR) tag exceptions. A CMR tag exception is detected when an unsupported CMR tag is encountered in a CMR. Having CMR tag fidelity allows additional CMR tags to be added in the future without necessarily causing exceptions in printers that do not support the new tags.

CMR Tag Fidelity

```
►►──FORMDEF──...──┬──────────────────────────────────────────────────┬──────────────►◄
                  └─CMRTAGFIDELITY──┬─STOP─────────────────────────────┤
                                    │          ┌─NOREPORT─┐            │
                                    └─CONTINUE─┼──────────┼────────────┘
                                               └─REPORT───┘
```

FORMDEF The full form definition command and all its other non-CMR subcommands are described in "FORMDEF Command" on page 257.

CMRTAGFIDELITY
Specify the exception continuation and reporting rules for Color Management Resource (CMR) tag exceptions.

STOP CMR Tag exception rule is "Stop presentation at point of first CMR tag exception and report the exception".

CONTINUE CMR Tag exception rule is "Do not stop presentation because of CMR tag exceptions and do one of the following:"

NOREPORT Do not report the CMR tag exception to the print server. This is the default if neither **NOREPORT** or **REPORT** is coded.

REPORT Report the CMR tag exception.

Code Example:

In the following example, if there is a CMR tag exception, processing will continue and the printer will report the exception to the print server.

```
FORMDEF cmrXm1  REPLACE yes CMRTAGFIDELITY continue report;
```

DEFINE CMRNAME Subcommand (FORMDEF and all PAGEDEF types)

```
►►──DEFINE──cmr-lname──CMRNAME──┬─'cmr-name'────┬──────────────────────────────►◄
                                └─X16'cmr-name'─┘
```

DEFINE CMRNAME

This command defines a CMR name. A CMR is identified with a name that is specified in a CMR resource object. The name is 73 characters and is based on an architected naming scheme to ensure uniqueness. This naming scheme includes field components such as CMR type, manufacturer, device type, device model number, and so forth. CMR names are fully described in the *Color Management Object Content Architecture Reference* manual.

Subcommands

cmr-lname

CMR local name. Specify a local name with up to 16 characters. This name is used to reference a CMR with a short user specified name. After defining the CMR name with a local name, it can be used on CMR commands and subcommands.

Note: This local name must be unique throughout the entire PPFA source file. That is, the local name cannot be reused in **DEFINE CMRNAME** commands that appear in different form definitions and/or page definitions if they are in the same source file.

'*cmr-name***'**

Specify the full 73 character CMR name. The name is entered as single byte characters and will be translated to UTF-16BE. The *cmr-name* must match exactly the name specified for this CMR in the Resource Installer. See "How to copy and paste a name from the AFP Resource Installer" on page 187 for more information.

Note: When doing the translation, PPFA uses a fixed table. That is it only translates from:
- EBCDIC code page 500, when run on z/OS systems
- ASCII code page 819, when run on Windows or AIX systems

*X16***'***cmr-name***'**

Specify the full CMR name as UTF-16 hex digits. The name is entered in its UTF-16BE encoding which takes 4 hex digits per character. No translation is needed.

Code Example

In the following example, there are three defined CMR names.
- Local name "bm1" is defined with a 73 character name in single quotes and no text type. The name will be translated into UTF-16BE. The example shows the name being split over 3 PPFA source lines which may be necessary because of source input record length. The character string can be copied-and-pasted from the AFP Resource installer. See the section titled "How to copy and paste a name from the AFP Resource Installer" on page 187.
- Local name "jm4" is specified with X16 data type. This means that the name will be entered in UTF-16BE hexadecimal digits.

- Local name “gen1dark” is a generic CMR. This is one of the registered generic CMRs. It is entered within single quotes which basically says it is coded with characters and will be translated to UTF-16BE.

CMR "bm1" is defined for the entire print file. It will be used to render color for all color resources in the print file unless overridden by a CMR with a more restricted scope. Below **COPYGROUP** “cg1” uses CMR “bm1” because it inherits from the form definition. Copygroup “cg2” will use CMRs "jm4" and copygroup “cg3” will use CMR “gen1dark” to render color resources for the groups of pages they control.

Example

```
FORMDEF cmrX12  REPLACE yes;
 DEFINE  bm1  CMRNAME
              'BillMay4HT001.200IBM@@4100@@'
              'PD194@whtgl90@2@@@rnd@@@141@600@'
              'proc@@@@@@@@' ;

 DEFINE  jm4  CMRNAME
              X16 '004A006F0068006E004D006100790034' /* JohnMay4  */
                  '00480054'                         /* HT        */
                  '003000300031002E003200300030'     /* 001.200   */
                  '00490042004D00400040'             /* IBM@@     */
                  '003400310030003000400040'         /* 4100@@    */
                  '005000440031'                     /* PD1       */
                  '003900340040'                     /* 94@       */
                  '007700680074'                     /* wht       */
                  '0067006C'                         /* gl        */
                  '003900300040'                     /* 90@       */
                  '00320040004000400040'             /* 2@@@      */
                  '0072006E0064004000400040'         /* rnd@@@    */
                  '0031003400310040'                 /* 141@      */
                  '0036003000300040'                 /* 600@      */
                  '00700072006F0063'                 /* proc      */
                  '00400040004000400040004000400040' /* @@@@@@@@  */
                    ;

 DEFINE  gen1dark  CMRNAME
     '@@@@@@@@TCgeneric@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@'
     'dark@@@@@@@@@@@@@@@@@@@@@@' ;

 CMR bm1 PRINTFILE INSTR;

 COPYGROUP cg1 ;

 COPYGROUP cg2 ;
  CMR  jm4    INSTR;

 COPYGROUP cg3 ;
  CMR  gen1dark INSTR;
```

How to copy and paste a name from the AFP Resource Installer

Here are the steps that the user must take to copy and paste the CMR name from the AFP Resource Installer:

1. On your workstation, start the AFP Resource Installer
2. Use the Select menu item in the Library menu on the menu bar to open the server resource library where the CMR resides. The server resource library will appear in the top pane of the AFP Resource Installer.
3. Select the server resource library in the top pane and use the Expand Selected menu item in the Views menu on the menu bar to show the CMRs that reside in the server resource library.
4. Select the CMR.
5. Use the Properties menu item in the Actions menu on the menu bar to open the Properties notebook for the selected CMR.
6. Copy the CMR Name shown in the Properties notebook.
7. Paste the CMR Name into the PPFA source code.

   Note: You may have to break the name up if you are using a platform that restricts the input source line length to less than 73. For example PPFA on z/OS restricts the input line to 72 bytes. In the PPFA code example below, the name is split over two lines with 42 and 31 characters each. In this case you would first copy the first 42 bytes of the name and paste them into line one, and then copy the remaining 31 bytes of the name into the second line.

Registered Generic Halftone CMRs

The following example is the Registered Generic Halftone CMRs. In a softcopy version of this publication, you may copy and paste the appropriate lines from this example into PPFA where you would use DEFINE CMRNAME.

```
@@@@@@@@HTgeneric@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@71@@@@@@@@@@@@@@@@@@
@@@@@@@@HTgeneric@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@85@@@@@@@@@@@@@@@@@@
@@@@@@@@HTgeneric@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@106@@@@@@@@@@@@@@@@@
@@@@@@@@HTgeneric@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@120@@@@@@@@@@@@@@@@@
@@@@@@@@HTgeneric@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@141@@@@@@@@@@@@@@@@@
@@@@@@@@HTgeneric@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@150@@@@@@@@@@@@@@@@@
@@@@@@@@HTgeneric@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@170@@@@@@@@@@@@@@@@@
@@@@@@@@HTgeneric@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@190@@@@@@@@@@@@@@@@@
@@@@@@@@HTgeneric@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@202@@@@@@@@@@@@@@@@@
@@@@@@@@HTgeneric@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@300@@@@@@@@@@@@@@@@@
@@@@@@@@HTgeneric@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@600@@@@@@@@@@@@@@@@@
@@@@@@@@HTgeneric@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@sto@@@@@@@@@@@@@@@@@@@@@@@
@@@@@@@@HTgeneric@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@dsp@@@@@@@@@@@@@@@@@@@@@@@
@@@@@@@@HTgeneric@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@erd@@@@@@@@@@@@@@@@@@@@@@@
@@@@@@@@HTgeneric@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@f-d@@@@@@@@@@@@@@@@@@@@@@@
@@@@@@@@HTgeneric@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@jjn@@@@@@@@@@@@@@@@@@@@@@@
@@@@@@@@HTgeneric@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@stu@@@@@@@@@@@@@@@@@@@@@@@
@@@@@@@@HTgeneric@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@brk@@@@@@@@@@@@@@@@@@@@@@@
@@@@@@@@HTgeneric@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@sra@@@@@@@@@@@@@@@@@@@@@@@
@@@@@@@@HTgeneric@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@s-a@@@@@@@@@@@@@@@@@@@@@@@
```

Figure 103. Generic Halftone CMRs

Registered Generic Tone Transfer Curve CMRs

The following example is the Registered Generic Tone Transfer Curve CMRs. In a softcopy version of this publication, you may copy and paste the appropriate lines from this example into PPFA where you would use DEFINE CMRNAME.

```
@@@@@@@@TCgeneric@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@dark@@@@@@@@@@@@@@@@@@@@@@
@@@@@@@@TCgeneric@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@accutn@@@@@@@@@@@@@@@@@@@@
@@@@@@@@TCgeneric@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@hilmid@@@@@@@@@@@@@@@@@@@@
@@@@@@@@TCgeneric@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@standd@@@@@@@@@@@@@@@@@@@@
```

Figure 104. Generic Tone Transfer Curve CMRs

CMR Subcommand (FORMDEF)

CMR Command

```
►►──CMR──cmr-lname──┬─PRINTFILE─┬───┬─AUDIT─┬──;──────────────────────────►◄
                    └─n (doc #)─┘   ├─INSTR─┤
                                    └─LINK──┘
```

CMR Specify a Color Management Resource (CMR), its scope, and its process mode to be associated with the entire print file or a specific document in the print file.

Multiple CMR commands are allowed in the form definition.

Parameters

cmr-lname The CMR local name. This name must have been defined with a **DEFINE CMRNAME** command.

scope parameter Specify whether the CMR is for the entire print file or a specific document in the print file. This parameter must immediately follow the cmr local name (*cmr-lname*).

PRINTFILE The scope of this CMR is the entire print file.

n **(document number)**
The scope of this CMR is the specified document.

processing mode parameter
Specify the processing mode for the CMR.

AUDIT CMRs with the audit processing mode refer to processing that has already been applied to a resource. In most cases, audit CMRs describe input data and are similar to ICC input profiles.

The audit processing mode is used primarily with color conversion CMRs. In audit processing mode, those CMRs indicate which ICC profile must be applied to convert the data into the Profile Connection Space (PCS).

INSTR CMRs with the instruction processing mode refer to processing that is done to prepare the resource for a specific printer using a certain paper or another device. Generally, instruction CMRs refer to output data and are similar to ICC output profiles.

The instruction processing mode is used with color conversion, tone transfer curve, and halftone CMRs. In instruction processing mode, these CMRs indicate how the system must convert a resource so it prints correctly on the target printer. The manufacturer of your printer should provide ICC profiles or a variety of CMRs that you can use. Those ICC profiles and CMRs might be installed in the printer controller, included with the printer on a CD, or available for download from the manufacturer's Web site.

LINK This CMR defines a direct color conversion from an input color space to a device output color space; process the **CMR** as a link CMR. This processing mode is only valid for device link (DL) CMRs. The PPFA command RENDER is not used with device link (DL) CMRs as such CMRs specify the intended rendering intent internally. This function requires print server (PSF) and printer support which is in addition to the original CMR support.

Code Example

In the following example, assume the **DEFINE CMRNAME** commands define the **CMR** names with local names (see the **DEFINE CMRNAME** command for more details).

Two **CMR**s are defined/associated:
1. The first **CMR** with local name “Picto550” is an audit CMR for a Picto camera and is to be associated with the entire print file.
2. The second **CMR** named “dark2” is a generic instruction CMR for the 5th document in the print file.

Example

```
DEFINE Picto550 CMRNAME
             'Pict1550CC001.001PictV550@@'
             'ES1@@@@@@@@@@@spac@@@@@@@@@@@RGB@'
             'XYZ@@@@@@@@@' ;
DEFINE dark2    CMRNAME
    '@@@@@@@@TCgeneric@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@'
    'dark@@@@@@@@@@@@@@@@@@@@@@' ;

FORMDEF cmrXm2  REPLACE yes;
  CMR Picto550   PRINTFILE audit;
  CMR dark2      5      instr;
 COPYGROUP cg1;
```

RENDER Subcommand (FORMDEF)

RENDER Command

```
                                 ┌──────────────────────────────────┐
                                 ▼                                  │  ┌─DEFAULT─┐
►►──RENDER──┬─PRINTFILE─┬────┬─IOCA──┬────┬─PERCEPTUAL─┬───┴──┤         ├──;──────────►◄
            └─n(doc #)──┘    ├─OBJC──┤    ├─SATURATION─┤         └─MONOCH──┘
                             ├─PTOCA─┤    ├─RELCM──────┤
                             └─GOCA──┘    └─ABSCM──────┘
```

RENDER
Specify the rendering intent (RI) and device output appearance for a print file or individual document.

RI is used to modify the final appearance of color data and is defined by the International Color Consortium (ICC). For more information on RI see the current level of the ICC Specification. Multiple **RENDER** commands are allowed in the form definition so long as they are for different scopes.

Device output appearance specifies the appearance to be assumed by the presentation device (printer).

Parameters

scope parameter
Specify whether the rendering intent is for the entire print file or a specific document in the print file. This parameter must immediately follow the **RENDER** keyword.

PRINTFILE The scope of this RI is the entire print file.

n **(document number)**
The scope of this RI is the specified document.

object type parameter
Specify the object type to which the following rendering intent parameters applies. Object type and rendering intent parameter pairs may be repeated to define RI for all object types.

IOCA The following rendering intent applies to all IOCA objects in the print file or specified document.

OBJC The following rendering intent applies to all non-OCA object containers in the print file or specified document.

PTOCA
The following rendering intent applies to all PTOCA objects in the print file or specified document.

GOCA
The following rendering intent applies to all GOCA objects in the print file or specified document.

rendering intent parameter
Specify the rendering intent for the preceding object type.

PERCEPTUAL
Perceptual rendering intent. It can be abbreviated as **PERCP**. With this rendering intent, gamut mapping is vendor-specific, and colors are adjusted

to give a pleasing appearance. This intent is typically used to render continuous-tone images.

SATURATION
Saturation rendering intent. It can be abbreviated as **SATUR**. With this rendering intent, gamut mapping is vendor-specific, and colors are adjusted to emphasize saturation. This intent results in vivid colors and is typically used for business graphics.

RELCM Media-relative colorimetric rendering intent. In-gamut colors are rendered accurately, and out-of-gamut colors are mapped to the nearest value within the gamut. Colors are rendered with respect to the source white point and are adjusted for the media white point. Therefore colors printed on two different media with different white points won't match colorimetrically, but may match visually. This intent is typically used for vector graphics.

ABSCM ICC-absolute colorimetric rendering intent. In-gamut colors are rendered accurately, and out-of-gamut colors are mapped to the nearest value within the gamut. Colors are rendered only with respect to the source white point and are not adjusted for the media white point. Therefore colors printed on two different media with different white points should match colorimetrically, but may not match visually. This intent is typically used for logos.

device output appearance parameter
Specify one of a set of architected appearances to be assumed by the presentation device.

DEFAULT Default appearance. The device assumes its normal appearance. For example, the default appearance of a process-color printer would be to generate full color output.

MONOCH Monochrome appearance. The device assumes a monochrome appearance such that the device's default color is used for presentation. The device can simulate color values with gray scale using the default color, or it can simulate color values by simply substituting the default color, or it can use some combination of the two.

Code Example

In the following example, there are four **RENDER** subcommands defined. Note that multiple **RENDER** subcommands for the same scope are not allowed:

1. The first **RENDER** is for the entire print file, and defines the RI for IOCA objects as perceptual. It also specifies the device output appearance to be monochromatic.
2. The second **RENDER** is for the document 5, and defines the RI for non-OCA objects as saturation. It also specifies the device output appearance to be the device default which will mean full color output for a color printer.

3. The third **RENDER** is for the document 7, and defines the RI for PTOCA objects as media-relative colorimetric. No device output appearance is specified.
4. The fourth **RENDER** is for the document 9, and defines the RI for all supported objects. It also specifies the device output appearance to be monochromatic.

Example

```
FORMDEF cmrXm3  REPLACE yes;
  RENDER  PRINTFILE  IOCA  perceptual  MONOCH ;
  RENDER  5          OBJC  saturation  DEFAULT;
  RENDER  7          PTOCA relcm         ;
  RENDER  9  OBJC  abscm  IOCA relcm PTOCA satur GOCA percp MONOCH;
 COPYGROUP cg1;
```

CMR Subcommand (COPYGROUP)

CMR Command

```
►►──CMR──cmr-lname──┬─AUDIT─┬─;──────────────────────────────────────────►◄
                    ├─INSTR─┤
                    └─LINK──┘
```

CMR

Specify a Color Management Resource (CMR) and its process mode for the collection of pages defined by a **COPYGROUP**. The command is to be placed after the **COPYGROUP** command for which it is intended.

Multiple CMR commands are allowed in the form definition.

Parameters

cmr-lname The CMR local name. This name must have been defined with a **DEFINE CMRNAME** command.

processing mode parameters: Specify the processing mode for the CMR.

AUDIT

CMRs with the audit processing mode refer to processing that has already been applied to a resource. In most cases, audit CMRs describe input data and are similar to ICC input profiles.

The audit processing mode is used primarily with color conversion CMRs. In audit processing mode, those CMRs indicate which ICC profile must be applied to convert the data into the Profile Connection Space (PCS).

INSTR

CMRs with the instruction processing mode refer to processing that is done to prepare the resource for a specific printer using a certain paper or another device. Generally, instruction CMRs refer to output data and are similar to ICC output profiles.

The instruction processing mode is used with color conversion, tone transfer curve, and halftone CMRs. In instruction processing mode, these CMRs indicate how the system must convert a resource so it prints correctly on the target printer. The manufacturer of your printer should provide ICC profiles or a variety of CMRs that you can use. Those ICC profiles and CMRs might be installed in the printer controller, included with the printer on a CD, or available for download from the manufacturer's Web site.

LINK This CMR defines a direct color conversion from an input color space to a device output color space; process the **CMR** as a link CMR. This processing mode is only valid for device link (DL) CMRs. The PPFA command RENDER is not used with device link (DL) CMRs as such CMRs specify the intended rendering intent internally. This function requires print server (PSF) and printer support which is in addition to the original CMR support.

Code Example

The following example shows two copy groups with defined CMRs.

- Copygroup “picto” defines a CMR for presenting digital pictures taken with a Picto camera (an audit CMR), and a generic instruction CMR which will be replaced with a device-specific CMR or the default printer CMR.
- Copygroup “snap” defines a CMR for presenting digital pictures taken with a Snap camera (an audit CMR), and a generic instruction CMR which will be replaced with a device-specific CMR or the default printer CMR.

Example

```
FORMDEF cmrX13  REPLACE yes;
 DEFINE Picto550 CMRNAME
              'Pict1550CC001.001PictV550@@'
              'ES1@@@@@@@@@@@spac@@@@@@@@@@@RGB@'
              'XYZ@@@@@@@@@' ;
 DEFINE snap1    CMRNAME
              'SnapDSC@CC001.001SNAP@DSC-R1'
              'CS@@@@@@@@@@@@spac@@@@@@@@@@@RGB@'
              'XYZ@@@@@@@@@';

 COPYGROUP picto   ;
  CMR  picto550 AUDIT;
  COPYGROUP snap   ;
  CMR  snap1  AUDIT;
```

RENDER Subcommand (COPYGROUP)

RENDER Command (COPYGROUP)

```
          ┌──────────────────────────────┐
          ▼                              │  ┌─DEFAULT─┐
►►─RENDER───┬─IOCA──┬──┬─PERCEPTUAL─┬────┴──┼─────────┼─;──────────────────►◄
            ├─OBJC──┤  ├─SATURATION─┤       └─MONOCH──┘
            ├─PTOCA─┤  ├─RELCM──────┤
            └─GOCA──┘  └─ABSCM──────┘
```

RENDER
Specify the Rendering Intent (RI) and device output appearance for the collection of pages/sheets presented by a **COPYGROUP**. The command is to be placed after the **COPYGROUP** command for which it is intended.

Parameters

object type parameters
Specify the object type to which the following rendering intent parameters applies. Object type and rendering intent parameter pairs may be repeated to define RI for all object types.

IOCA
The following rendering intent applies to all IOCA objects in the pages presented by the **COPYGROUP**.

OBJC
The following rendering intent applies to all non-OCA object in the pages presented by the **COPYGROUP**.

PTOCA
The following rendering intent applies to all PTOCA objects in the pages presented by the **COPYGROUP**.

GOCA
The following rendering intent applies to all GOCA objects in the pages presented by the **COPYGROUP**.

rendering intent parameter
Specify the rendering intent for the preceding object type.

PERCEPTUAL
Perceptual rendering intent. It can be abbreviated as **PERCP**. With this rendering intent, gamut mapping is vendor-specific, and colors are adjusted to give a pleasing appearance. This intent is typically used to render continuous-tone images.

SATURATION
Saturation rendering intent. It can be abbreviated as **SATUR**. With this rendering intent, gamut mapping is vendor-specific, and colors are adjusted to emphasize saturation. This intent results in vivid colors and is typically used for business graphics.

RELCM
Media-relative colorimetric rendering intent. In-gamut colors are rendered accurately, and out-of-gamut colors are mapped to the nearest value within the gamut. Colors are rendered with

respect to the source white point and are adjusted for the media white point. Therefore colors printed on two different media with different white points won't match colorimetrically, but may match visually. This intent is typically used for vector graphics.

ABSCM ICC-absolute colorimetric rendering intent. In-gamut colors are rendered accurately, and out-of-gamut colors are mapped to the nearest value within the gamut. Colors are rendered only with respect to the source white point and are not adjusted for the media white point. Therefore colors printed on two different media with different white points should match colorimetrically, but may not match visually. This intent is typically used for logos.

device output appearance parameter

Specify one of a set of architected appearances to be assumed by the presentation device.

DEFAULT Default appearance. The device assumes its normal appearance. For example, the default appearance of a process-color printer would be to generate full color output.

MONOCH Monochrome appearance. The device assumes a monochrome appearance such that the device's default color is used for presentation. The device can simulate color values with grayscale using the default color, or it can simulate color values by simply substituting the default color, or it can use some combination of the two.

Code Example

The following example shows two copy groups, one with IOCA RI defined and monochromatic appearance, and one with RI for all object types and the device default appearance.

Example

```
FORMDEF cmrXm4  REPLACE yes;
 COPYGROUP cg1;
  RENDER  IOCA  percp MONOCH ;
 COPYGROUP cg2;
  RENDER  DEFAULT OBJC  abscm IOCA relcm PTOCA satur
                 GOCA percp;
```

CMR Subcommand (PAGEFORMAT)

CMR Command (PAGEFORMAT)

```
►►──CMR──cmr-lname───┬─AUDIT─┬──;────────────────────────────────────────►◄
                     ├─INSTR─┤
                     └─LINK──┘
```

CMR
Associate a Color Management Resource (CMR) with pages presented by a **PAGEFORMAT**. The command is to follow the **PAGEFORMAT** command. Multiple **CMR** commands are allowed in a **PAGEFORMAT**.

Parameters

cmr-lname	The CMR local name. This name must have been defined with a **DEFINE CMRNAME** command.

processing mode parameter: Specify the processing mode for the CMR.

AUDIT
CMRs with the audit processing mode refer to processing that has already been applied to a resource. In most cases, audit CMRs describe input data and are similar to ICC input profiles.

The audit processing mode is used primarily with color conversion CMRs. In audit processing mode, those CMRs indicate which ICC profile must be applied to convert the data into the Profile Connection Space (PCS).

INSTR
CMRs with the instruction processing mode refer to processing that is done to prepare the resource for a specific printer using a certain paper or another device. Generally, instruction CMRs refer to output data and are similar to ICC output profiles.

The instruction processing mode is used with color conversion, tone transfer curve, and halftone CMRs. In instruction processing mode, these CMRs indicate how the system must convert a resource so it prints correctly on the target printer. The manufacturer of your printer should provide ICC profiles or a variety of CMRs that you can use. Those ICC profiles and CMRs might be installed in the printer controller, included with the printer on a CD, or available for download from the manufacturer's Web site.

Code Example

In the following example, two CMRs are defined/associated for all pages presented with pageformat “pf5”:

1. The first CMR named “mycmr” is an audit CMR for a digital camera.
2. The second CMR named “dark1” is a “generic” instruction CMR.

Example

```
DEFINE mycmr CMRNAME
           'Pict1550CC001.001PictV550@@'
           'ES1@@@@@@@@@@@spac@@@@@@@@@@@RGB@'
           'XYZ@@@@@@@@@' ;

DEFINE dark1 CMRNAME
    '@@@@@@@@TCgeneric@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@'
    'dark@@@@@@@@@@@@@@@@@@@@@@' ;
```

```
PAGEDEF cmrXm5  REPLACE yes;

 PAGEFORMAT pf5;
   CMR  mycmr           AUDIT;
   CMR  dark1           INSTR;

   PRINTLINE;

 PAGEFORMAT pfx;
   PRINTLINE;
```

RENDER Subcommand (in a PAGEFORMAT)

RENDER Command (PAGEFORMAT)

```
              ┌──────────────────────────┐
              ▼                          │
▶▶──RENDER────┬─IOCA──┬──┬─PERCEPTUAL─┬──┴──;────────────────────────────────▶◀
              ├─OBJC──┤  ├─SATURATION─┤
              ├─PTOCA─┤  ├─RELCM──────┤
              └─GOCA──┘  └─ABSCM──────┘
```

RENDER
Specify the page/overlay scope rendering intent (RI) for the pages formatted by this **PAGEFORMAT**. The **RENDER** command must follow the **PAGEFORMAT** command but precede the **PRINTLINE**, **LAYOUT**, or **XLAYOUT** commands.

RI is used to modify the final appearance of color data and is defined by the International Color Consortium (ICC). For more information on RI see the current level of the ICC Specification.

Parameters

object type parameter
Specify the object type to which the following rendering intent parameters applies. Object type and rendering intent parameter pairs may be repeated to define RI for all object types.

IOCA
The following rendering intent applies to an IOCA objects in the page/overlay that are presented by the **PAGEFORMAT**.

OBJC
The following rendering intent applies to a non-OCA object containers in the page/overlay that are presented by the **PAGEFORMAT**.

PTOCA
The following rendering intent applies to a PTOCA objects in the page/overlay that are presented by the **PAGEFORMAT**.

GOCA
The following rendering intent applies to a GOCA objects in the page/overlay that are presented by the **PAGEFORMAT**.

rendering intent parameter
Specify the rendering intent for the preceding object type.

PERCEPTUAL
Perceptual rendering intent. It can be abbreviated as **PERCP**. With this rendering intent, gamut mapping is vendor-specific, and colors are adjusted to give a pleasing appearance. This intent is typically used to render continuous-tone images.

SATURATION
Saturation rendering intent. It can be abbreviated as **SATUR**. With this rendering intent, gamut mapping is vendor-specific, and colors are adjusted

	to emphasize saturation. This intent results in vivid colors and is typically used for business graphics.
RELCM	Media-relative colorimetric rendering intent. In-gamut colors are rendered accurately, and out-of-gamut colors are mapped to the nearest value within the gamut. Colors are rendered with respect to the source white point and are adjusted for the media white point. Therefore colors printed on two different media with different white points won't match colorimetrically, but may match visually. This intent is typically used for vector graphics.
ABSCM	ICC-absolute colorimetric rendering intent. In-gamut colors are rendered accurately, and out-of-gamut colors are mapped to the nearest value within the gamut. Colors are rendered only with respect to the source white point and are not adjusted for the media white point. Therefore colors printed on two different media with different white points should match colorimetrically, but may not match visually. This intent is typically used for logos.

Code Example

In the following example, there are four different pages (**PAGEFORMAT**s) with **RENDER** commands defined.

1. The first page **RENDER** command defines the RI for IOCA objects as perceptual.
2. The second page **RENDER** command defines the RI for non-OCA objects as saturation.
3. The third page **RENDER** command defines the RI for PTOCA objects as media-relative colorimetric.
4. The fourth page **RENDER** command defines the RI for all supported objects.

Example

```
PAGEDEF cmrXm6  REPLACE yes;

 PAGEFORMAT pf6a;
  RENDER  IOCA  perceptual;
  PRINTLINE;

 PAGEFORMAT pf6b;
  RENDER  OBJC  saturation;
  PRINTLINE;

 PAGEFORMAT pf6c;
  RENDER  PTOCA relcm;
  PRINTLINE;

 PAGEFORMAT pf6d;
  RENDER  OBJC  abscm  IOCA relcm PTOCA satur GOCA percp;
  PRINTLINE;
```

OBJECT Command (Traditional, Record Format, XML)

OBJECT Command (Traditional, Record Format, XM)

```
►►──OBJECT──...──OBTYPE──┬─PSEG─────────────────────────┬─...──────────────►
                         ├─IOCA─────────────────────────┤
                         ├─BCOCA────────────────────────┤
                         ├─GOCA─────────────────────────┤
                         └─OTHER──OBID──┬─component-id─┤
                                        └─type-name────┘


                                        ┌──────────────────────────────────────┐
                                        ▼                       ┌─NOPRELOAD─┐  │
►─RENDER──┬─PERCEPTUAL─┬─...──────OB2CMR──cmr-lname──┬─AUDIT─┬─┴───────────┴──┴──►
          ├─SATURATION─┤                             ├─INSTR─┤ └─PRELOAD───┘
          ├─RELCM──────┤                             └─LINK──┘
          └─ABSCM──────┘

►─...──;───────────────────────────────────────────────────────────────────────►◄
```

OBJECT The full **OBJECT** command and all its other non-CMR subcommands are described in “OBJECT Command” on page 423.

OBTYPE Specifies the object type.

PSEG
No change, see page 426.

GOCA
No change, see page 426.

BCOCA
No change, see page 426.

IOCA
No change, see page 426.

OTHER
No change, see page 426.

OBID
No change, see page 427.

RENDER Subcommand on the **OBJECT** command to specify the rendering intent (RI) for an object within a page definition.

RI is used to modify the final appearance of color data and is defined by the International Color Consortium (ICC). For more information on RI see the current level of the ICC Specification.

Notes:

1. Rendering intent on a BCOCA object is fixed as media-relative colorimetric (**RELCM**), so **RENDER** doesn't have to be coded for a BCOCA object. But if you do specify something other than RELCM, PPFA will flag an error.

2. A page segment (**PSEG** object type) can contain many object types. If you specify **RENDER** for a **PSEG**, PPFA sets that rendering intent type for all object types in the page segment.

rendering intent parameter
Specify the rendering intent for the preceding object type.

PERCEPTUAL
Perceptual rendering intent. It can be abbreviated as **PERCP**. With this rendering intent, gamut mapping is vendor-specific, and colors are adjusted to give a pleasing appearance. This intent is typically used to render continuous-tone images.

SATURATION
saturation rendering intent. It can be abbreviated as **SATUR**. With this rendering intent, gamut mapping is vendor-specific, and colors are adjusted to emphasize saturation. This intent results in vivid colors and is typically used for business graphics.

RELCM
media-relative colorimetric rendering intent. In-gamut colors are rendered accurately, and out-of-gamut colors are mapped to the nearest value within the gamut. Colors are rendered with respect to the source white point and are adjusted for the media white point. Therefore colors printed on two different media with different white points won't match colorimetrically, but may match visually. This intent is typically used for vector graphics.

ABSCM
ICC-absolute colorimetric rendering intent. In-gamut colors are rendered accurately, and out-of-gamut colors are mapped to the nearest value within the gamut. Colors are rendered only with respect to the source white point and are not adjusted for the media white point.Therefore colors printed on two different media with different white points should match colorimetrically, but may not match visually. This intent is typically used for logos.

OB2CMR
Specify a Color Management Resource (CMR) and its process mode for a data object within the page definition. CMRs are secondary objects when used at this level. Multiple **OB2CMR** subcommands are allowed on the **OBJECT** command.

cmr-lane
The CMR local name. This name must have been defined with a **DEFINE CMRNAME** command.

processing mode parameter
Specify the processing mode for the CMR.

AUDIT
CMRs with the audit processing mode refer to processing that has already been applied to a resource. In most cases, audit CMRs describe input data and are similar to ICC input profiles.

The audit processing mode is used primarily with color conversion CMRs. In audit processing mode, those CMRs indicate which ICC profile must be applied to convert the data into the Profile Connection Space (PCS).

INSTR

CMRs with the instruction processing mode refer to processing that is done to prepare the resource for a specific printer using a certain paper or another device. Generally, instruction CMRs refer to output data and are similar to ICC output profiles.

The instruction processing mode is used with color conversion, tone transfer curve, and halftone CMRs. In instruction processing mode, these CMRs indicate how the system must convert a resource so it prints correctly on the target printer. The manufacturer of your printer should provide ICC profiles or a variety of CMRs that you can use. Those ICC profiles and CMRs might be installed in the printer controller, included with the printer on a CD, or available for download from the manufacturer's Web site.

LINK

This CMR defines a direct color conversion from an input color space to a device output color space; process the **CMR** as a link CMR. This processing mode is only valid for device link (DL) CMRs. The PPFA command RENDER is not used with device link (DL) CMRs as such CMRs specify the intended rendering intent internally. This function requires print server (PSF) and printer support which is in addition to the original CMR support.

NOPRELOAD or PRELOAD

All specified secondary resources are kept. If you wish the CMR object to be preloaded prior to the running of this job, specify it here.

Code Example

In the following example, an object with CMR is defined. The **LAYOUT** commands below place the object on the page. The CMR name is defined and referenced by the CMR local name. See the **DEFINE CMRNAME** command for examples and instructions on defining CMR names.

Example

```
PAGEDEF cmr89   replace yes;
    FONT  varb  gt10   ;           /*Variable data          */
    SETUNITS  LINESP .25 in ;      /* Line spacing          */

 DEFINE srgb CMRNAME
  'sRGBicc_CC001.000@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@'
   '@@@@@@';

 Object  oc1  obxname 'Flowers_with_sRGB_profile'
    obtype  other obid 23 OBKEEP
    ob2cmr srgb audit

    PAGEFORMAT  rept1   TOPMARGIN 1 in BOTMARGIN  2 in;
     LAYOUT 'startpage' BODY  NEWPAGE POSITION 1 in NEXT
      font varb
     object oc1 0 in 3 in obsize 6.5 in 8.5 in;
     LAYOUT 'basicline' BODY  POSITION SAME NEXT font varb;
```

FIELD command (All Page Definition Types)

Bar Code CMR subcommand

```
                            ┌───────────────────────────────┐
                            ▼                               │
►►──FIELD──...──BARCODE──...──┬───────────────────────────┬──┴──...──;────────►◄
                              └─CMR──cmr-lname──┬─AUDIT─┬─┘
                                                ├─INSTR─┤
                                                └─LINK──┘
```

FIELD The full **FIELD** command and all its other non-CMR subcommands are described in “FIELD Command” on page 354.

Subcommand

CMR Specify a Color Management Resource (CMR) and its process mode for the bar code object being presented.

cmr-lname
The CMR local name. This name must have been defined with a **DEFINE CMRNAME** command.

Note: This parameter must immediately follow the **CMR** keyword.

processing mode parameter
Specify the processing mode for the CMR.

AUDIT
CMRs with the audit processing mode refer to processing that has already been applied to a resource. In most cases, audit CMRs describe input data and are similar to ICC input profiles.

The audit processing mode is used primarily with color conversion CMRs. In audit processing mode, those CMRs indicate which ICC profile must be applied to convert the data into the Profile Connection Space (PCS).

INSTR
CMRs with the instruction processing mode refer to processing that is done to prepare the resource for a specific printer using a certain paper or another device. Generally, instruction CMRs refer to output data and are similar to ICC output profiles.

The instruction processing mode is used with color conversion, tone transfer curve, and halftone CMRs. In instruction processing mode, these CMRs indicate how the system must convert a resource so it prints correctly on the target printer. The manufacturer of your printer should provide ICC profiles or a variety of CMRs that you can use. Those ICC profiles and CMRs might be installed in the printer controller, included with the printer on a CD, or available for download from the manufacturer's Web site.

LINK
This CMR defines a direct color conversion from an input

color space to a device output color space; process the **CMR** as a link CMR. This processing mode is only valid for device link (DL) CMRs. The PPFA command RENDER is not used with device link (DL) CMRs as such CMRs specify the intended rendering intent internally. This function requires print server (PSF) and printer support which is in addition to the original CMR support.

Code Example

In the following example, 2 bar codes are defined with CMRs specified. The bar codes are defined for traditional, record format and XML page definitions.

Note: The **DEFINE CMRNAME**s for “mycmr” and **dark1** are used in each page definition but defined only once. Page definitions that are in the same source file can only define a local CMR name once. This is because a **DEFINE CMRNAME** definition is global for all page definitions and form definitions in the same source code file.

Example

```
DEFINE mycmr   CMRNAME
            'Pict1550CC001.001PictV550@@'
            'CS@@@@@@@@@@@spac@@@@@@@@@@@RGB@'
            'XYZ@@@@@@@@@' ;
DEFINE dark1   CMRNAME
    '@@@@@@@@TCgeneric@@@@@@@@@@@@@@@@@@@@@@@@@@@@'
    'dark@@@@@@@@@@@@@@@@@@@@@' ;


/* Traditional Pagedef        */
PAGEDEF cmr10P  REPLACE yes;
  PRINTLINE;
    FIELD Start 1 Length 20
     BARCODE TYPE code39 MOD 1
       CMR myCMR  audit;
    FIELD Start 21 Length 40
     BARCODE TYPE code39 MOD 1
       CMR dark1  instr;

/* Record Layout Pagedef      */
PAGEDEF cmr10L  REPLACE yes;
  Font f1;
  LAYOUT 'l1';
    FIELD Start 1 Length 20
     BARCODE TYPE code39 MOD 1
       CMR myCMR  audit;
    FIELD Start 21 Length 40
     BARCODE TYPE code39 MOD 1
       CMR dark1  instr;

/* XML Pagedef                */
PAGEDEF cmr10X  REPLACE yes;
  Font f1 TYPE ebcdic;
  XLAYOUT QTAG 'x1';
    FIELD Start 1 Length 20
     BARCODE TYPE code39 MOD 1
       CMR myCMR  audit;
    FIELD Start 21 Length 40
     BARCODE TYPE code39 MOD 1
       CMR dark1  instr;
```

EXTREF Command

The **EXTREF** command specifies resources that are to be mapped in the page. It is a way in PPFA to map objects that wouldn't otherwise be mapped. If an object contains another mapped object, the contained object must be mapped, but PPFA will not automatically map that object.

EXTREF	The full **EXTREF** command and all its other non-CMR subcommands are described in “EXTREF Command” on page 349.

Parameters

OB2CMR

```
├──OB2CMR──lname───┬─AUDIT─┬──────────────────────────────────────────┤
                   ├─INSTR─┤
                   └─LINK──┘
```

Specify a Color Management Resource (CMR) and its process mode for a data object specified within an included object. CMRs are secondary objects when used at this level. An object specified here will be mapped with “object” scope.

cmr-lname

The CMR local name. This name must have been defined with a **CMRNAME** command.

processing-mode-parameter

Specify the processing mode for the CMR.

AUDIT

CMRs with the audit processing mode refer to processing that has already been applied to a resource. In most cases, audit CMRs describe input data and are similar to ICC input profiles.

The audit processing mode is used primarily with color conversion CMRs. In audit processing mode, those CMRs indicate which ICC profile must be applied to convert the data into the Profile Connection Space (PCS).

INSTR

CMRs with the instruction processing mode refer to processing that is done to prepare the resource for a specific printer using a certain paper or another device. Generally, instruction CMRs refer to output data and are similar to ICC output profiles.

The instruction processing mode is used with color conversion, tone transfer curve, and halftone CMRs. In instruction processing mode, these CMRs indicate how the system must convert a resource so it prints correctly on the target printer. The manufacturer of your printer should provide ICC profiles or a variety of CMRs that you can use. Those ICC profiles and CMRs might be installed in the printer controller, included with the printer on a CD, or available for download from the manufacturer's Web site.

LINK

This CMR defines a direct color conversion from an input color space to a device output color space; process the **CMR** as a link CMR. This processing mode is only valid for device link (DL) CMRs. The PPFA command RENDER is not used with device link

(DL) CMRs as such CMRs specify the intended rendering intent internally. This function requires print server (PSF) and printer support which is in addition to the original CMR support.

OB2R

```
├──OB2R──┬─────────────┬──OB2XNAME──┬─x2name──────┬──────────────────────┤
         ├─i2name──────┤            ├─'x2name'────┤
         ├─'i2name'────┤            ├─C'x2name'───┤
         ├─C'i2name'───┤            ├─E'x2name'───┤
         ├─E'i2name'───┤            ├─A'x2name'───┤
         ├─A'i2name'───┤            ├─X'hhhh'─────┤
         └─X'hhhh'─────┘            ├─U8'x2name'──┤
                                    ├─U16'x2name'─┤
                                    ├─x8'hhhh'────┤
                                    └─x16'hhhh'───┘
```

Specify a secondary object to be mapped.

If an included object contains a reference to one or more secondary objects, you must identify them at this point. Specify the internal name for the secondary resource as specified in the included resource. If the internal name contains special characters such as periods or blanks, then quotes must surround the name.

i2name
Unquoted name up to 250 characters long will be folded to upper case and translated into EBCDIC if necessary.

'i2name'
Quoted name up to 250 characters long will be accepted as-is with no case folding or translation.

C'i2name'
Quoted name with a "C" for Character will be treated the same as a quoted name of up to 250 characters. No folding or translation will be done.

E'i2name'
Quoted name with an "E" for EBCDIC entered with up to 250 characters will be accepted as-is if on an EBCDIC platform or translated to EBCDIC if on an ASCII platform. The translation will be made with no case folding.

A'i2name'
Quoted name with an "A" for ASCII entered with up to 250 single-byte characters will be accepted as-is if on an ASCII platform or translated to ASCII if on an EBCDIC platform. The translation will be made with no case folding.

X'hhhh'
Quoted name with an "X" for Hexadecimal entered with up to 500 hexadecimal characters. The characters will be translated to hexadecimal, but no assumptions of data type will be made.

OB2XNAME *x2name*
Specifies the external name for a secondary resource object. The name can be up to 250 characters. If the name contains special characters or blanks, then quotes must surround the name.

x2name
Unquoted name up to 250 characters long will be folded to upper case and translated into EBCDIC if necssary.

'x2name'
Quoted name up to 250 characters long will be accepted as-is with no case folding or translation.

C'x2name'
Quoted name with an "C" for Character will be treated the same as a quoted name up to 250 characters. No folding or translation is done.

E'x2name'
Quoted name with an "E" for EBCDIC entered with up to 250 single-byte characters will be accepted as-is if on an EBCDIC platform or translated to EBCDIC if on an ASCII platform. The translation will be made with no case folding.

A'x2name'
Quoted name with an "A" for ASCII entered with up to 250 single-byte characters will be accepted as-is on an ASCII platform or translated to ASCII if on an EBCDIC platform. The translation will be made with no case folding.

X'hhhh'
Quoted name with an "X" for Hexadecimal entered with up to 500 hexadecimal characters. The characters will be translated to hexadecimal, but no assumption of data type will be made.

U8'x2name'
Quoted name with a "U8" for UTF-8 entered with up to 250 single-byte characters will be translated to UTF-8.

X8'hhhh'
Quoted name with an "X8" for UTF-8 HEX entered with up to 500 single-byte hexadecimal characters will be translated to hexadecimal and assumed to be data type UTF-8. There must be a multiple of 2 hexadecimal characters entered.

U16'x2name'
Quoted name with a "U16" for UTF-16 entered with up to 125 single-byte characters will be translated to UTF-16.

X16'hhhh'
Quoted name with an "X16" for UTF-16 HEX entered with up to 500 single-byte hexadecimal characters will be translated to hexadecimal and assumed to be data type UTF-16. There must be a multiple of 4 hexadecimal characters entered.

OB2ID *n* | *type-name*

```
├──OB2ID──┬─n─────────┬──────────────────────────────────────────────┤
          └─type-name─┘
```

Component type identifier for secondary resource' use an object type number as specified in Object type list adjustments. Use an object type number from the "Component-id" column or a type name from the "Type name " of the following table:

Table 7. Object Types that can be referenced as Secondary Resources

Type-Name	Component-id	Description of OID Type-Name
PDFRO	26	PDF Resource Object (new)
RESCLRPRO	46	Resident Color Profile Resource Object
IOCAFS45RO	47	IOCA FS45 Resource Object Tile (new)

Example:

In the example below, the CMR “rtvc” is mapped in the Object Environment Group (OEG) of an object that is being included in the page.

Note: If we code “rtvc” with a CMR command (as in the commented out CMR command) it will be mapped but will be active for the entire page and we only want it to be active for the object in whose OEG it is mapped.

```
   DEFINE rvtc CMRNAME
'RevVideoTC001.000@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@'
     '@@@@@@' DNXCMR;

   SETUNITS  LINESP .25 in ;      /* Line spacing          */

   PAGEFORMAT  rept1   TOPMARGIN .25 in;
     EXTREF OB2CMR rvtc instr;
```

DRAWGRAPHIC Command (Record Format and XML)

PAGEDEF - CMR & RENDER Subcommands on DRAWGRAPHIC command

```
►►──DRAWGRAPHIC──┬─BOX─────┬─...─┬─────────────────────────────┬──────────────────────►
                 ├─LINE────┤     └─RENDER──┬─PERCEPTUAL─┬─┘
                 ├─CIRCLE──┤               ├─SATURATION─┤
                 └─ELLIPSE─┘               ├─RELCM──────┤
                                           └─ABSCM──────┘


    ┌──────────────────────────────┐
    ▼                              │
►───┬────────────────────────────┬─┴─;──────────────────────────────────────────────►◄
    └─CMR──cmr-lname──┬─AUDIT─┬──┘
                      ├─INSTR─┤
                      └─LINK──┘
```

DRAWGRAPHIC
The full **DRAWGRAPHIC** command and all its other non-CMR subcommands are described in:

- "DRAWGRAPHIC - BOX Command (Record Format and XML only)" on page 323
- "DRAWGRAPHIC - LINE Command (Record Format and XML only)" on page 330
- "DRAWGRAPHIC - CIRCLE Command (Record Format and XML only)" on page 335
- "DRAWGRAPHIC - ELLIPSE Command (Record Format and XML only)" on page 341

Subcommand

RENDER Subcommand on the **DRAWGRAPHIC** command to specify the rendering intent (RI) for the graphics object being presented.

RI is used to modify the final appearance of color data and is defined by the International Color Consortium (ICC). For more information on RI see the current level of the ICC Specification.

rendering intent parameter
Specify the rendering intent for the defined graphic (GOCA) object.

PERCEPTUAL
Perceptual rendering intent. It can be abbreviated as **PERCP**. With this rendering intent, gamut mapping is vendor-specific, and colors are adjusted to give a pleasing appearance. This intent is typically used to render continuous-tone images.

SATURATION
Saturation rendering intent. It can be abbreviated as **SATUR**. With this rendering intent, gamut mapping is vendor-specific, and colors are adjusted to emphasize saturation. This intent results in vivid colors and is typically used for business graphics.

RELCM
Media-relative colorimetric rendering intent. In-gamut colors are rendered accurately, and out-of-gamut colors are mapped to the nearest value within the gamut. Colors are rendered with respect to the source white point and are adjusted for the media white point. Therefore colors printed on two different media with different white points won't match colorimetrically, but may match visually. This intent is typically used for vector graphics.

ABSCM
ICC-absolute colorimetric rendering intent. In-gamut colors are rendered accurately, and out-of-gamut colors are mapped to the nearest value within the gamut. Colors are rendered only with respect to the source white point and are not adjusted for the media white point. Therefore colors printed on two different media with different white points should match colorimetrically, but may not match visually. This intent is typically used for logos.

CMR Specify a Color Management Resource (CMR) and its process mode for a graphics object within the page definition.

cmr-lname
The CMR local name. This name must have been defined with a **DEFINE CMRNAME** command.

Note: This parameter must immediately follow the CMR keyword.

processing mode parameter
Specify the processing mode for the CMR.

AUDIT
CMRs with the audit processing mode refer to processing that has already been applied to a resource. In most cases, audit CMRs describe input data and are similar to ICC input profiles.

The audit processing mode is used primarily with color conversion CMRs. In audit processing mode, those CMRs indicate which ICC profile must be applied to convert the data into the Profile Connection Space (PCS).

INSTR
CMRs with the instruction processing mode refer to processing that is done to prepare the resource for a specific printer using a certain paper or another device. Generally, instruction CMRs refer to output data and are similar to ICC output profiles.

The instruction processing mode is used with color conversion, tone transfer curve, and halftone CMRs. In instruction processing mode, these CMRs indicate how the system must convert a resource so it prints correctly on the target printer. The manufacturer of your printer should provide ICC profiles or a variety of CMRs that you can use. Those ICC profiles and CMRs might be installed in the printer controller, included with the printer on a CD, or available for download from the manufacturer's Web site.

LINK
This CMR defines a direct color conversion from an input color space to a device output color space; process the **CMR** as a link CMR. This processing mode is only valid for device link (DL) CMRs. The PPFA command RENDER is not used with device link (DL) CMRs as such CMRs specify the intended rendering intent internally. This function requires print server (PSF) and printer support which is in addition to the original CMR support.

Code Example

The following examples show how to define CMRs and rendering intent for graphics objects. Rendering intent and a CMR are defined for Record Format and XML page definitions which are the only two page definitions types for which **DRAWGRAPHIC** commands are legal.

```
DEFINE mycmr CMRNAME
             'Pict1550CC001.001PictV550@@'
             'CS@@@@@@@@@@@@spac@@@@@@@@@@@RGB@'
             'XYZ@@@@@@@@@' ;

PAGEDEF cmr11L  REPLACE yes;
  FONT f1;
  LAYOUT 'l1';
    DRAWGRAPHIC BOX  BOXSIZE 1 in 2 in
      RENDER relcm CMR  myCMR audit;

PAGEDEF cmr11X  REPLACE yes;
  FONT f1 TYPE ebcdic;
  XLAYOUT QTAG 'x1';
    DRAWGRAPHIC BOX  BOXSIZE 1 in 2 in
      RENDER relcm CMR  myCMR audit;
```

Part 3. PPFA Commands and Syntax

Chapter 9. PPFA Command Syntax

PPFA controls are made up of four elements: commands, subcommands, parameters, and literals.

- *Commands* are controls representing the major functions of PPFA and are separated from other commands by semicolons. Each command has its own entry in Chapter 10, "Form Definition Command Reference," on page 223 and in Chapter 11, "Page Definition Command Reference," on page 301.
- *Subcommands* fall within commands and specify the function of that command.
- *Parameters* specify the values for one subcommand.
- *Literals* consist of fixed text included in a field definition or as constant data for comparison in a conditional processing definition.

Rules for Creating a PPFA Command Stream

When you create a PPFA command stream, follow these rules:

- Before processing the commands, PPFA converts lowercase characters into uppercase characters, except those in literals. Thus, it does not discriminate between uppercase and lowercase characters. For example, **OVERLAY abc** and **overlay ABC** produce the same results because both **overlay** and **abc** are converted to uppercase.
- User names for form definitions and page definitions must not be the same as PPFA command names and subcommand names. These are reserved words. For a list of the reserved words, see Appendix F, "PPFA Keywords," on page 609. For example, **REPEAT** or **CHANNEL** must not be form-definition names.
- The subcommands governed by a command can be entered in any order; however, the name of a font or form definition, for example, must come immediately after the object being named. Parameters defined in a subcommand must be entered immediately after the subcommand.
- Commands must end with a semicolon.
- A command or subcommand can start in any column and can continue on the next line without a continuation indicator.
- More than one form definition and page definition can be specified in a job stream.
- PPFA neither checks nor sets default values for items that depend on printer hardware.

Token Rules

Tokens are character strings, within a set of PPFA commands, that PPFA recognizes as units. Tokens include:

- Both local names and user-access names for fonts, form definitions, page definitions, overlays, and suppressions
- Commands
- Subcommands
- Parameters
- Literals
- Special characters

The only PPFA element that is not a token is a blank. A token cannot be split between two lines.

To create a token, you must separate a string from the previous token by either a special character or a blank. See the list of special characters in “Character Set.” Thus, A+B is the same as A + B, because + is a special character. But AB is not the same as A B. The blank in A B creates two tokens.

Character Set

The four types of characters are alphabetic, numeric, blank, and special. Characters of each type are as follows:

- The following are PPFA alphabetic characters:

  A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
  a b c d e f g h i j k l m n o p q r s t u v w x y z
  # @ $
- The following are PPFA numeric characters:

  0 1 2 3 4 5 6 7 8 9
- The blank character has a character code of X'20' in ASCII (which is the data stream used for creating the form definition or page definition

  Note: In EBCDIC data, the blank character has a character code of X'40'.
- The following are PPFA special characters:

  . (+*) – % ' = ;   / &
- The following are EBCDIC shift-out and shift-in codes:
  X'0E', the shift-out (SO) code
  X'0F', the shift-in (SI) code

Other character codes are also allowed within comments and literals. See “Comments” on page 219 and “Literals” on page 220 for details of what can be included.

Command Delimiters

A command always ends with a semicolon. One command can extend over several lines and does not end until a semicolon appears.

Blanks and Blank Lines

Blanks and blank lines can occur anywhere and have no effect on the processing of PPFA. The “;” is the command delimiter.

Names

The maximum number of alphanumeric characters in a PPFA name varies. Table 8 shows the number of characters allowed in the PPFA names.

Table 8. Character Length for PPFA Names

Type of Name	Number of Characters Allowed
Form Definition	
COPYGROUP	1–8
DEFINE CMRNAME (local name)	1–16
DEFINE CMRNAME (user-access name)	73
FORMDEF	1–6
OVERLAY (local name)	1–16
OVERLAY (user-access name)	1–6
SUPPRESSION	1–8
Page Definition	
BARCODE	1–8
CONDITION	1–8
DEFINE COLOR	1–10
DEFINE CMRNAME (local name)	1–16
DEFINE CMRNAME (user-access name)	73
DEFINE QTAG (local name)	1–16
DEFINE QTAG (XML tag names)	1–125
DOFONT (local name)	1–16
DOFONT (user-access name)	1–125
FONT (local name)	1–16
FONT (user-access name)	1–6
OBJECT (local-name)	1–16
OBJECT (external name) (See note)	1–250
Secondary **OBJECT** (internal name) (See note)	1–250
Secondary **OBJECT** (external name) (See note)	1–250
OVERLAY	1–6
PAGEDEF	1–6
PAGEFORMAT	1–8
SEGMENT	1–6
Note: This name is further restricted to 250 bytes. For data type UTF-16 this is a maximum of 125 characters or less if surrogate characters are required. Some platforms have a limit of 8 characters.	

Comments

Programmer comments used to document PPFA command streams are allowed anywhere within the command stream. Comments must be enclosed with the delimiters `/*` and `*/`. A comment is allowed anywhere a blank is allowed and can continue for any number of lines.

Note: For VSE, however, a comment must not start at the beginning of the line. A /* specified as the first two bytes of a record in PPFA running under VSE is interpreted as the end of system input.

The following example shows the available variations in comment formats:

```
FIELD /* comment */ FONT GT10 /* comment,
  multiline comment,
  more comment */ START * + 10  LENGTH 5 ;
FIELD LENGTH 10 ; FIELD START * + 10  LENGTH 15 ;
```

Notes:

1. A comment must end with the closing delimiter (*/).
2. Double-byte character codes in comments must be enclosed within SO (X'0E') and SI (X'0F') on EBCDIC platforms.

Literals

A literal is any string specified in single quotation marks. Literals can be used within a:

- **TEXT** subcommand to create fixed text for a page definition
- **WHEN** subcommand to define constant text for comparison

Literals can contain any characters in any position, except those that have special syntactic meanings. Single quotation marks may be used within a literal only if they are entered in pairs ('). PPFA translates a pair of single quotation marks into one quotation mark. For example, `'JOAN''S'` yields JOAN'S.

A literal can continue for any number of lines. For example:

```
TEXT 'THIS IS ' 'A LITERAL' /* The four separated        */
     'THE TEXT SPANS'       /* text elements will produce*/
     'THREE LINES'  ;       /* one sequence of text      */

TEXT X'0101'                /* Hexadecimal literals      */
     X'ABAB'                /* spanning three lines      */
     X'BBBB'        ;

TEXT K'100,200'             /* kanji numbers             */
     K'321,400'     ;       /* specified sequentially    */
```

Invalid:

```
TEXT 'THIS IS'
    K'100,200'      ;       /* Mixing single-byte and
                               double-byte characters in one
                               field is not allowed */
```

A double-byte literal must be enclosed within apostrophe shift-out (X'7D0E') and shift-in apostrophe (X'0F7D').

Numeric Values

Numeric variables are specified as decimal numbers; up to three decimal places can be specified.

Units of Measurement

Numbers used to specify dimensions in form definitions and page definitions can be in any of five units of measurement. They are specified in a command stream as follows:

IN inches

MM	millimeters
CM	centimeters
POINTS	Points are a common measurement in printing used to measure character height, as in 20-point type. A point is approximately 1/72 inch.
PELS	(equates to L-units) The number of pels per inch is a user-specified parameter. The default is 240 pels per inch.

Two additional measurement units can be used in the **SETUNITS** command; the measurement units are:

LPI	lines per inch
CPI	characters per inch

The parameters in PPFA that define a measurement can include any of the first five units of measurement shown in the previous list. For example:

```
POSITION  1 IN  1 IN ;
        or
POSITION  1 MM  1 MM ;
```

However, PPFA converts all measurements to logical units (L-units) as the common measurement. (Normally, one inch equals 240 L-units, but this number can be changed by the user.) If a fraction exists, the first decimal point is truncated. A **SETUNITS** command defines a unit of measurement that is to be used as the default for any parameter that does not specify a given dimension. This default is in effect until another **SETUNITS** command is encountered. This example:

```
SETUNITS  1 IN 1 IN ;
⋮
POSITION (or OFFSET or LINEONE) 1 1 ;
```

shows part of a PPFA command stream in which a **SETUNITS** command sets the units of measurement to one inch for a subsequent **POSITION** (or **OFFSET** or **LINEONE**) subcommand.

SETUNITS can be used as a multiplier:

```
SETUNITS 2 IN 2 IN ;
⋮
POSITION 2 2 ;
```

In this example, the **SETUNITS** command sets two-inch *x* and *y* default values. The **POSITION** subcommand values are multiplied by the default values creating a position four inches horizontally and four inches vertically from a given reference point. See “SETUNITS Command” on page 294 for a more detailed explanation.

Diagram Shorthand

These terms are used in the command definitions:

x-pos	A horizontal position using a numeric number followed optionally by a unit. For the available units, see “Units of Measurement” on page 220.
y-pos	A vertical position using a numeric number followed optionally by a unit. For the available units, see “Units of Measurement” on page 220.

Chapter 10. Form Definition Command Reference

This section includes:
- Sequence of commands for form definitions
- Form definition commands listed alphabetically
- Detailed information on each command
- Descriptions of the applicable subcommands and parameters for each command

Sequence of Commands for Form Definitions

```
[SETUNITS ...]
FORMDEF
[SUPPRESSION ...]
  [DEFINE CMRNAME...]
  [CMR...]
  [CMRTAGFIDELITY...]
  [RENDER...]
[COPYGROUP ]
  [CMR ...]
  [OVERLAY ...]
  [RENDER ...]
  [SUBGROUP ...]
```

1. **SUPPRESSION** commands must be specified immediately after **FORMDEF** commands. The exception is the **SETUNITS** command (see item 5).
2. One file can contain multiple sets of form definitions.
3. **OVERLAY** and **SUBGROUP** commands must be specified under their associated **COPYGROUP** command. The **OVERLAY** commands must be specified immediately after a **COPYGROUP** command.
   - The **OVERLAY** command is required only to designate an overlay that is to be kept in the 3800 printer as raster data, or to specify a local name for referencing an overlay in a **SUBGROUP** command. If you do not code the **OVERLAY** command, you can still specify an overlay in a **SUBGROUP** command using its user-access name.
   - Overlays also may be specified using the **N_UP** subcommand of the **FORMDEF** or **COPYGROUP** command, or using the **PRINTLINE** command in the page definition. If the overlay is specified in one of these ways, it should also not be coded on the **OVERLAY** or **SUBGROUP** commands shown here. For more information, see "Medium Overlays and Page Overlays" on page 169.

   Notes:

   a. If the form definition has only one copy group, the **COPYGROUP** command can be omitted. The **OVERLAY** command then follows any **SUPPRESSION** command.
   b. The appearance of a misplaced **OVERLAY** command prior to the first **COPYGROUP** command causes a default **COPYGROUP** to be generated as the first **COPYGROUP**.
4. The first **COPYGROUP** command can be omitted in a form definition if it contains only one copy group and no **OVERLAY** commands. If it is omitted, the **FORMDEF** command parameters are used to define the copy group.
5. A **SETUNITS** command can be placed before any PPFA command. The values set are in effect until the next **SETUNITS** command.
6. Each command can appear more than once under one **FORMDEF** command.

7. To do an **INSERT** finishing task, select a **COPYGROUP** that specifies the dedicated **INSERT** bin number[3] from which the pages are to be inserted and apply (usually dummy) print data to that page. Observe that nothing is printed on the inserted page.

---

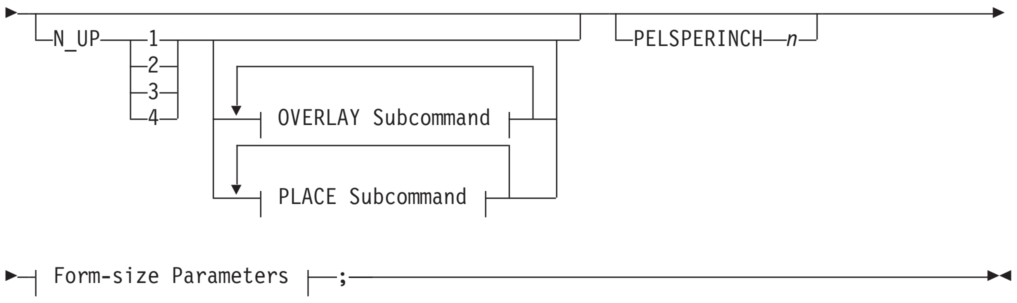
[3] The **INSERT** bin number is printer specific. See the documentation for the specific printer being used.

COPYGROUP Command

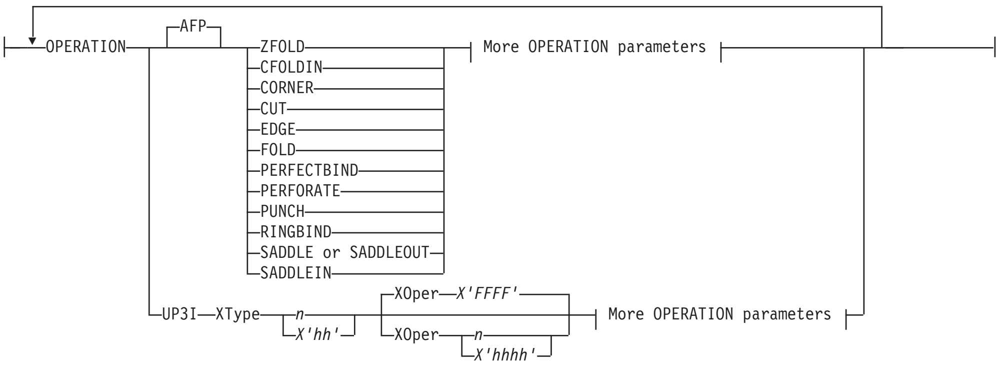
COPYGROUP Command

```
►►──COPYGROUP──name──┬─────────────────────────────────────────────┬──────────►
                     └─OFFSET──rel-x - rel-y──┬─────────────────┬──┘
                                              └─rel-x - rel-y───┘

   ┌─BIN──1──────────────────────────────────────────────────────────┐
►──┼─────────────────────────────────────────────────────────────────┼────────►
   └─BIN──┬────────────┬──┬──────────────────────┬──┬─────────────┬─┘
          ├─n──────────┤  └─MEDIANAME──qstring───┘  └─COMPID──m────┘
          ├─MANUAL─────┤
          └─ENVELOPE───┘

►──┬──────────────┬──┬──────────────────────────┬──┬─────────────────────────────┬──►
   └─OUTBIN──n────┘  └─CONSTANT───┬─NO─────┬────┘  └─DIRECTION───┬─ACROSS──┬────┘
                                  ├─BACK───┤                     ├─DOWN────┤
                                  ├─FRONT──┤                     └─REVERSE─┘
                                  └─BOTH───┘

                                                             ┌─CUTSHEET──NO──┐
►──┬───────────────────────────────┬──┬──────────────────────┬─┼───────────────┼──►
   └─PRESENT───┬─PORTRAIT───┬──────┘  └─DUPLEX───┬─NO───────┬─┘ └─CUTSHEET──YES─┘
               └─LANDSCAPE──┘                    ├─NORMAL───┤
                                                 ├─TUMBLE───┤
                                                 ├─RNORMAL──┤
                                                 └─RTUMBLE──┘

►──┬─────────────────────────────────────────────────────────────────────────┬──►
   └─FINISH──┬─SCOPE──SHEET──OPERATION──AFP──ZFOLD──REFERENCE──DEFAULT──┬────┘
             ├──────────────────────────────────────────────────────────┤
             │  ┌────────────────────────────────────────────────────┐  │
             │  ▼ ┌─SCOPE──SHEET────────────┐                        │  │
             └────┼─────────────────────────┼──┤ OPERATION Parameters ├──┘
                  └─SCOPE────┬─SHEET────┬───┘
                             ├─BEGCOLL──┤
                             └─CONTCOLL─┘

                   ┌─INVOKE──SHEET──────────┐
►──┬─────────────┬─┼────────────────────────┼──┬──────────────────┬──┬──────────────┬──►
   └─ADJUST──n───┘ └─INVOKE────┬─NEXT───┬───┘  └─JOG────┬─YES──┬──┘  └─QUALITY──n───┘
                               ├─FRONT──┤               └─NO───┘
                               └─BACK───┘

►──┬────────────────────────────────────────┬──────────────────────────────────►
   │             ┌───────────────────────┐  │
   └─PROCESSING──▼─┬─────────────────────┬─┴──┘
                   │           ┌───┐     │
                   ├─MEDIA_INFO──▼─n─┴───┤
                   ├─PERFORATE───────────┤
                   └─CUT─────────────────┘
```

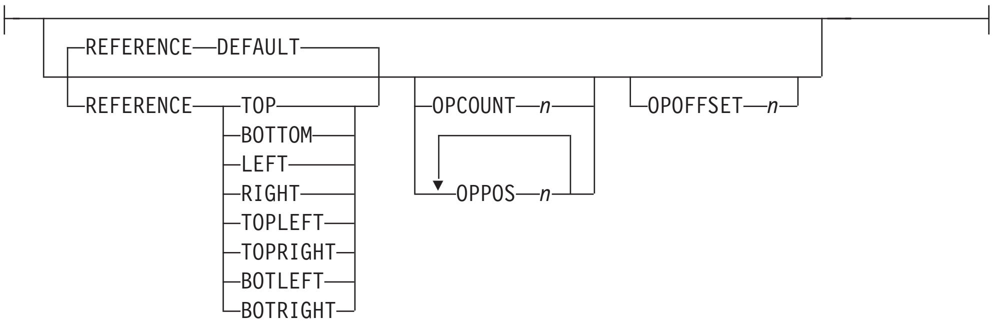
COPYGROUP Command



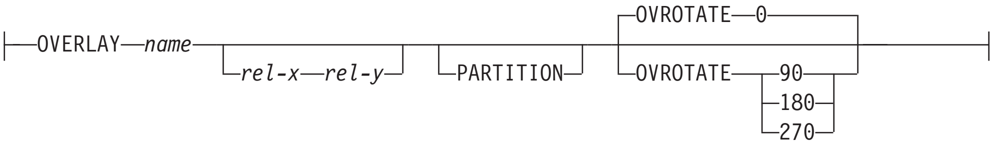
OPERATION Parameters:



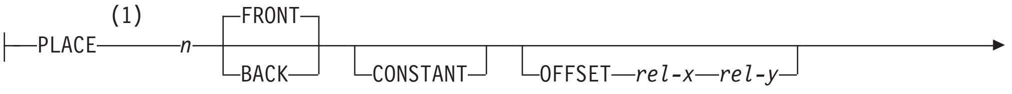
More OPERATION Parameters:



OVERLAY Subcommand:



PLACE Subcommand:



```
                                 ┌─ROTATION──0──────────┐ ┌─VIEW──YES─┐
►─────────────────────────────┬──┼──────────────────────┼─┼───────────┼──────────────────┤
   └─┤ Overlay Subcommand ├─┘    └─ROTATION──┬─90──┬────┘ └─VIEW──NO──┘
                                             ├─180─┤
                                             └─270─┘
```

Form-size Parameters:

```
├──┬────────────────────────┬──┬────────────────────────┬──────────────────────────────┤
   └─XMSIZE──x──┬─────────┬─┘  └─YMSIZE──y──┬─────────┬─┘
                └─units───┘                 └─units───┘
```

Notes:

1 The use of the **PLACE** subcommand indicates enhanced **N_UP** printing.

Copy groups are subsets of a form definition. A form definition can contain one or several copy groups. Copy groups are nested within a form definition following any **SUPPRESSION** command. **COPYGROUP** subcommands have no fixed defaults; if any subcommand is omitted, its value is selected from the corresponding subcommand in the **FORMDEF** command.

Notes:

1. Subsets of copy groups are called subgroups.
2. If you specified **DUPLEX NO** anywhere in the copy group, output is simplex regardless of any other **DUPLEX** subcommand within the same copy group.
3. If a form definition has only one copy group, the **COPYGROUP** command can be omitted. If omitted, a name is automatically assigned by PPFA to the copy group, using the form definition resource name, including the F1 prefix. All values for the copy group are given the values from the **FORMDEF** command and subcommands. You need to know this name should you use conditional processing and need to invoke this copy group by name. Copy groups are placed within the form definition in the order in which they are generated.
4. To change copy groups during formatting, use conditional processing.
5. Another way to change copy groups after the resource is stored is to insert an Invoke Medium Map structured field into your print data file (copy groups are known to the print server as medium maps). If no Invoke Medium Map structured field is found and no conditional processing is being performed, the first copy group in the form definition is used for the job.

COPYGROUP *name*

Defines an alphanumeric name of 1–8 characters. This name must be unique in a single form definition. If any names are duplicated, PPFA issues an error message and does not create the form definition.

Subcommands

OFFSET

```
├──┬──────────────────────────────────────────┬──────────────────────────────────────────┤
   └─OFFSET──rel-x - rel-y──┬───────────────┬─┘
                            └─rel-x - rel-y─┘
```

Specifies the relative offset of the logical page for both the front and back pages in reference to the media origin. The media origin is printer dependent. For more information about media origin, see your printer publications.

If you specify offset values for the back of the page, you must also specify the front offset values.

Note: The **OFFSET** subcommand does not affect the position of medium overlays.

rel-x Specifies the relative horizontal offset of the logical page on the front or back side of the copy group relative to the media origin. The valid options for *rel-x* are described in the **SETUNITS** command for the horizontal value.

If no unit is specified, a default setting is:
- Taken from the last **SETUNITS** command
- **IN** (inch) if no **SETUNITS** command has been issued

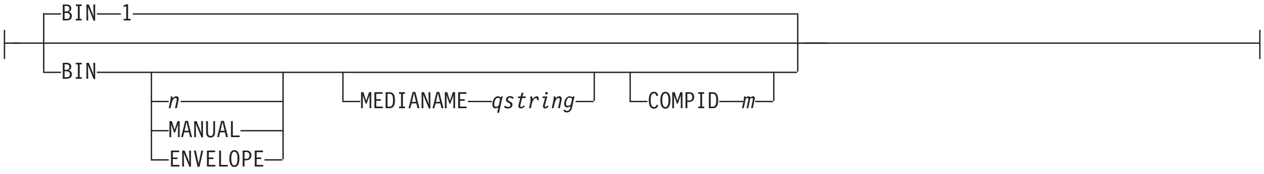
rel-y Specifies the relative vertical offset for the logical page for the front or back side of the page. The valid options for *rel-y* are described in the **SETUNITS** command for the vertical value.

Note: The vertical offset for the 3800 must be 0.5 inch or greater.

If no unit is specified, a default setting is:
- Taken from the last **SETUNITS** command
- **IN** (inch) if no **SETUNITS** command has been issued

Notes:
1. If **OFFSET** is *not* specified, the **OFFSET** default is **0.1 IN 0.1 IN**
2. You may specify this offset as negative in order to crop the top and/or left of an image.

BIN



Specifies the paper source. This subcommand should be used only for printers that have more than one paper source.

1	Selects the primary paper source.
2–255	Selects another paper source. If the specified bin does not exist on your printer, the default paper source for that printer is used. For more information about paper sources on your printer, refer to your printer publications.
MANUAL	Selects manual feed as a paper source on those printers that support manual feed. For more information, refer to your printer publications.
ENVELOPE	Selects an envelope paper source on those printers

that support this function. For more information, refer to your printer publications.

MEDIANAME

Selects a media source by specifying an agreed-upon name for the bin.

qstring Up to 12 characters within single quotes, specifying the media source name. On some printers, this name is pre-set into the printer; on other printers, it can also be entered into the printer by the user. For a current list of the valid media names, see Appendix G, "PPFA Media Names," on page 611. Refer to your printer publications for further information.

Notes:

1. BIN selection is overridden by the printer if the form defined to each bin is the same form number. Only the primary bin is selected.
2. The primary source usually contains either letter-size (U.S.) or A4 (I.S.O.) paper. Other paper sources are used for less common paper sizes (such as legal-size) and for special paper (such as colored stock or pre-printed letterhead on heavy bond).
3. If duplexing is requested and you select from the front side from one bin and the back side from another bin, a warning message is issued and the printer takes the paper from the bin specified on the front side.

COMPID Selects a bin based on the component id.

m For a current list of component ids, see Appendix G, "PPFA Media Names," on page 611. Component ids from 12,288 to 268,435,455 are reserved for the user.

OUTBIN *n*

```
├──┬─────────────┬──────────────────────────────────────────────────────┤
   └─OUTBIN──n───┘
```

Specifies the destination bin number for any pages directed by this **COPYGROUP**. Subgroups in this form definition that do not specify an output bin number inherit this one.

n the output bin number

CONSTANT

```
├──┬──────────────────────┬───────────────────────────────────────────┤
   └─CONSTANT──┬─NO────┬──┘
               ├─BACK──┤
               ├─FRONT─┤
               └─BOTH──┘
```

Specifies whether the constant-forms function is on or off and whether constant form is to be printed on the front or back sides of a sheet.

NO	Specifies that the constant forms function is off.
BACK	Specifies that a constant form is to be printed on the back side without variable data.
FRONT	Specifies that a constant form is to be printed on the front side without variable data.
BOTH	Specifies that a constant form is to be printed on both sides without variable data.

DIRECTION

```
├──┬───────────────────────────┬──────────────────────────────────────┤
   └─DIRECTION──┬─ACROSS──┬────┘
                ├─DOWN────┤
                └─REVERSE─┘
```

Determines, along with the **PRESENT** subcommand, how data is oriented on printers whose media origin can be changed. See the list of printers Chapter 7, "N_UP Printing," on page 147.
If you are printing line data, you usually specify the same value for the **DIRECTION** subcommand as is specified for the **DIRECTION** subcommand in the page definition.

ACROSS	Specifies that the pages are formatted in the **ACROSS** printing direction.
DOWN	Specifies that the pages are formatted in the **DOWN** printing direction.
REVERSE	Specifies that the pages are formatted in the **REVERSE** printing direction.

If the **DIRECTION** subcommand is specified, you must specify the **PRESENT** subcommand. The default for **DIRECTION** is determined by the value specified for **PRESENT**.

The direction default of **PORTRAIT** is **ACROSS**; the direction default of **LANDSCAPE** is **DOWN**. If neither **PRESENT** nor **DIRECTION** is specified, the default is **PRESENT PORTRAIT** and **DIRECTION ACROSS**.

PRESENT

```
├──┬────────────────────────────┬─────────────────────────────────────┤
   └─PRESENT──┬─PORTRAIT───┬────┘
              └─LANDSCAPE──┘
```

Specifies, along with the **DIRECTION** subcommand, how the data is oriented on printers whose media origin can be changed.
The **PRESENT** and **DIRECTION** subcommands are only supported by cut-sheet printers when you specify the **N_UP**

subcommand or the **CUTSHEET** subcommand with the **YES** parameter. See Figure 71 on page 148 through Figure 74 on page 150 to determine the effect of the **PRESENT** and **DIRECTION** subcommands when you use them with the **N_UP** subcommand.

PORTRAIT	Specifies that the pages are printed in the portrait page presentation, with their short edges at the top and bottom and their long edges at the sides.
LANDSCAPE	Specifies that the pages are printed in the landscape page presentation, with their long edges at the top and bottom and their short edges at the sides.

DUPLEX

```
├──┬─────────────────────────┬──────────────────────────────────────────────────────────┤
   └─DUPLEX──┬─NO──────┬─────┘
             ├─NORMAL──┤
             ├─TUMBLE──┤
             ├─RNORMAL─┤
             └─RTUMBLE─┘
```

Specifies whether printing is done on both sides of the sheet. This subcommand should be used only for page printers that have duplex capability.

NO	Duplex printing is not performed.
NORMAL	Duplex printing is performed, with the tops of both sides printed along the same edge for side binding.
TUMBLE	Duplex printing is performed with the top of one side and the bottom of the other printed along the same edge of the sheet for top binding.
RNORMAL	Rotated normal. Duplex printing is performed with the tops of both sides printed along the same edge. Used with landscape pages, **N_UP 2**, and **N_UP 3**.
RTUMBLE	Rotated tumble. Duplex printing is performed with the top of one side printed along the same edge of the sheet as the bottom of the other. Used with landscape pages, **N_UP 2**, and **N_UP 3**.

CUTSHEET

```
   ┌─CUTSHEET──NO──┐
├──┼───────────────┼──────────────────────────────────────────────────────────────────┤
   └─CUTSHEET──YES─┘
```

If you are using a cut-sheet printer, this subcommand specifies whether the medium orientation information, using the **DIRECTION** and/or **PRESENT** subcommands, is to be passed to the printer. The default value is **NO**.

YES	Specifies the rotation data is to be passed.
NO	Specifies the rotation data is not to be passed unless **N_UP** is coded.

Notes:

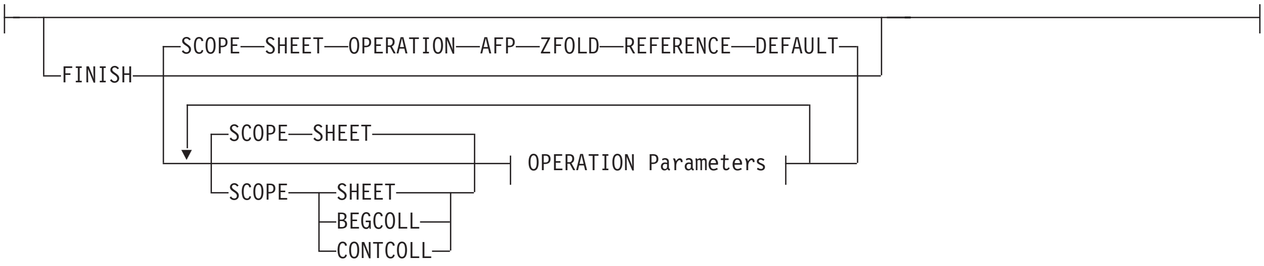
1. If you have a continuous form printer, the medium orientation information is passed. If you have a cut-sheet printer and **N_UP** is coded, the orientation information is passed.
2. If you have a cut-sheet printer and **CUTSHEET YES** is coded, the orientation information is passed, providing you also have a level of the print server that supports that feature.
3. You must have a printer that allows its media origin to be changed in order to use this subcommand.

Example:

In the following example, the **CUTSHEET** subcommand is coded on the form definition to give copygroups c1 and c2 “**CUTSHEET YES**” behavior and copygroup c3 “**CUTSHEET NO**” behavior. The copygroup c1 inherits its behavior from the form definition.

```
FORMDEF cut1 REPLACE YES CUTSHEET YES;
     COPYGROUP c1 ;
     COPYGROUP c2 CUTSHEET YES ;
     COPYGROUP c3 CUTSHEET NO ;
```

FINISH



A finishing operation is to be performed on this **COPYGROUP**. This option is to be used only on a document, set of documents, or an entire print file.

SCOPE

Determines to which sheets the finishing operation is applied.

Note: **SCOPE** can be repeated within a **FINISH** subcommand, but only one **SCOPE** of a particular type is allowed in each **COPYGROUP** command. For example, only one **SCOPE BEGCOLL** is allowed in a **COPYGROUP** command.

Single Sheet Scope

Operations with this **SCOPE** are applied to a single sheet.

SHEET Single sheet Medium-map level scope. The specified finishing operation is applied to each sheet individually.

Collection Scope

Collection/Medium-map level scope. All sheets generated by this medium map are collected and the specified finishing operations are applied to this collection.

Note: Some finishing operation combinations are not compatible. Compatible combinations are dependent upon the presentation-device.

BEGCOLL Begin medium-map level collections. This causes a sheet eject and starts a medium-map-level media collection for the specified operation. If a collection for the same finishing operation is already in progress from a previous medium map, that collection is ended and its specified finishing operation is applied. The media collection started with **BEGCOLL** continues until:

1. The end of the document is reached.
2. A medium map is invoked that is not **CONTINUE COLLECTION** for this same operation command.

When a finishing collection is ended for any of the above reasons, the specified finishing operation is applied.

CONTCOLL Continue medium-map level collection. This continues a medium-level media collection that was started for the same finishing operation by a previous medium map. The media collection started with **CONTCOLL** continues until:

1. The end of the document is reached.
2. A medium map is invoked that is not **CONTINUE COLLECTION** for this same operation command.

When a finishing collection is ended for any of the above reasons, the specified finishing operation is applied.

OPERATION

OPERATION parameters:

```
   ┌──────────────────────────────────────────────────────────────────────┐
   ▼              ┌─AFP─┐                                                 │
├──OPERATION──┬───┴─────┴──┬─ZFOLD───────────────┬─┤ More OPERATION parameters ├─┬─┴──────────────────┤
              │            ├─CFOLDIN─────────────┤                              │
              │            ├─CORNER──────────────┤                              │
              │            ├─CUT─────────────────┤                              │
              │            ├─EDGE────────────────┤                              │
              │            ├─FOLD────────────────┤                              │
              │            ├─PERFECTBIND─────────┤                              │
              │            ├─PERFORATE───────────┤                              │
              │            ├─PUNCH───────────────┤                              │
              │            ├─RINGBIND────────────┤                              │
              │            ├─SADDLE or SADDLEOUT─┤                              │
              │            └─SADDLEIN────────────┘                              │
              └─┤ UP3I parameters ├─────────────────────────────────────────────┘
```

Specifies the type of **FINISH** operation and parameters.

Notes:

1. Compatible operations can be repeated with a specified **SCOPE**.
2. Your print server may have a limit on the number of collection operations allowed at one time.

Note: The default for **OPERATION** is **ZFOLD**. It is necessary to code **OPERATION** only if **REFERENCE** is coded.

AFP Specifies that these are Advanced Function Presentation (AFP) operations as defined in the *Mixed Object Document Content Architecture Reference*, SC31-6802 and the *Intelligent Printer Data Stream Reference*, S544-3417.

SHEET Operations

These operations operate on a single sheet of paper and are valid for **SCOPE SHEET**.[4]

CFOLDIN

Center Fold In. Specifies that the media is folded inward along the center line that is parallel to the finishing operation axis. After this operation, the back side of the last sheet of the collection is outside. The **OPCOUNT** and **OPPOS** parameters are ignored for this operation. **CFOLDIN** is applied to collected media, not to individual media.

Note: The datastream pages must already be properly ordered for the **CFOLDIN** operation.

CUT Specifies that a separation cut is applied to the media along the axis of the

---

[4] The **PAGE** scope is obsolete. The **SHEET** subcommand should be used instead of **PAGE** subcommand. For compatibility purposes, the **PAGE** command is accepted as an alias for **SHEET**.

finishing operation. The **OPCOUNT** and **OPPOS** parameters are ignored for this operation.

FOLD Specifies that the media is folded along the axis of the finishing operation. The folding is performed along the axis of the finishing operation. The **OPCOUNT** and **OPPOS** parameters are ignored for this operation. This operation is applied to collected media, not to individual media.

PERFORATE
Specifies that a perforation cut is applied to the media along the axis of the finishing operation. The **OPCOUNT** and **OPPOS** parameters are ignored for this operation.

PUNCH
Specifies that one or more holes are to be punched or drilled into the media along the finishing axis. **PUNCH** is applied to the collected media, not to individual media.

ZFOLD
Perform a **ZFOLD** operation along the finishing edge (axis). Z-Folding causes the sheet to first be folded in half inwards (the front side of the sheet is now inside the fold) along a line parallel to the reference edge. The half of the sheet originally furthest from the reference edge is again folded in half outwards along a line parallel to the reference edge. For example, when Z-Folding is applied to an 11 by 17 inch sheet with the reference edge along a short side, the result is an 8.5 by 11 inch fold-out. The **OPOFFSET**, **OPCOUNT**, and **OPPOS** parameters are ignored for this operation. This operation is applied to an individual sheet.

Note: **REFERENCE** is the only parameter allowed for **ZFOLD** and the only reference edges allowed are **DEFAULT**, **TOP**, **BOTTOM**, **LEFT**, and **RIGHT**.

AFP Collection Operations
These operations operate on a collection of sheets and are valid with **BEGCOLL** and **CONTCOLL**.

CFOLDIN Center Fold In. Specifies that the media is folded inward along the center line that is parallel to the finishing operation axis. After this operation, the back side of the last sheet of the collection is outside. The **OPCOUNT** and **OPPOS** parameters are ignored for this operation. **CFOLDIN** is applied to collected media, not to individual media.

Note: The datastream pages must already be properly ordered for the **CFOLDIN** operation.

CORNER
Specifies that one staple is driven into the media at the reference corner (see **REFERENCE** parameter). For corner staples, the offset and angle of the staple from the selected corner is device dependent. The **OPCOUNT** and **OPPOS** parameters are ignored for this operation. This operation is applied to collected media, not to individual media.

CUT
Specifies that a separation cut is applied to the media along the axis of the finishing operation. The **OPCOUNT** and **OPPOS** parameters are ignored for this operation.

EDGE
Specifies that one or more staples are driven into the media along the axis of the finishing operation. This operation is applied to collected media, not to individual media.

FOLD
Specifies that the media is folded along the axis of the finishing operation. The folding is performed along the axis of the finishing operation. The **OPCOUNT** and **OPPOS** parameters are ignored for this operation. This operation is applied to collected media, not to individual media.

PERFECTBIND
This operation specifies a type of book binding that glues the sheets of the group together at

	the reference edge (spine). When you specify **PERFECTBIND**, the **OPOFFSET**, **OPCOUNT**, and **OPPOS** parameters are ignored.
PERFORATE	Specifies that a perforation cut is applied to the media along the axis of the finishing operation. The **OPCOUNT** and **OPPOS** parameters are ignored for this operation.
PUNCH	Specifies that one or more holes are to be punched or drilled into the media along the finishing axis. **PUNCH** is applied to the collected media, not to individual media.
RINGBIND	This operation specifies a type of book binding when the sheets of the group are loosely connected at the reference edge (spine) by first drilling or punching a set of holes along the reference edge and then inserting a wire pattern through the holes. When you specify **RINGBIND**, the **OPOFFSET**, **OPCOUNT**, and **OPPOS** parameters are ignored.
SADDLE (same as SADDLEOUT)	Specifies that one or more staples are driven into the media along the axis of the finishing operation, which is positioned at the center of the media, parallel to the reference edge (see **REFERENCE** parameter). The **OPOFFSET** parameter is ignored for this operation. This operation also includes a fold of the media outward along the finishing operation axis so that the front side of the first sheet in the collection is on the outside of the media collection. This operation is applied to collected media, not to individual media.
SADDLEIN	Specifies that one or more staples are driven into the media along the axis of the finishing operation, which is positioned at the center of the

media, parallel to the reference edge (see **REFERENCE** parameter). The **OPOFFSET** parameter is ignored for this operation. This operation also includes a fold of the media inward along the finishing operation axis so that the front side of the first sheet in the collection is on the inside of the media collection. This operation is applied to collected media, not to individual media.

Note: The datastream pages must already be properly ordered for the **SADDLEIN** operation.

UP3i

Specifies that these operations will be passed to the printer using the Universal Printer Pre- and Post-Processing Interface (UP3i) finishing interface as specified in the “Form Finishing Operation Triplet” in the UP3i specification document. UP3i is an open standard intelligent interface intended for printers, pre-processors, post-processors, and other related applications.

Notes:

1. To use this function you must have printer server support as well as an attached UP3i device for the specified operation.
2. The complete UP3i specification document which includes the “Form Finishing Operation Triplet” can be viewed at the UP3i website home page:

   http://www.up3i.org

UP3i Explicit Operations

UP3I parameters:

```
                              ┌─XOper──X'FFFF'──────┐
├──UP3I──XType──┬─n─────┬─────┼─────────────────────┼─┤ More OPERATION parameters ├──────────────────┤
                └─X'hh'─┘     └─XOper──┬─n───────┬──┘
                                       └─X'hhhh'─┘
```

Specifies the explicit values for the “Finishing Operation Type” and the “Finishing Operation Parameter” that go in the UP3i Form Finishing Operation Triplet.

Notes:

1. PPFA does *not* check that the **XType**, **XOper**, or operation parameters are contextually correct. This allows new UP3i operations

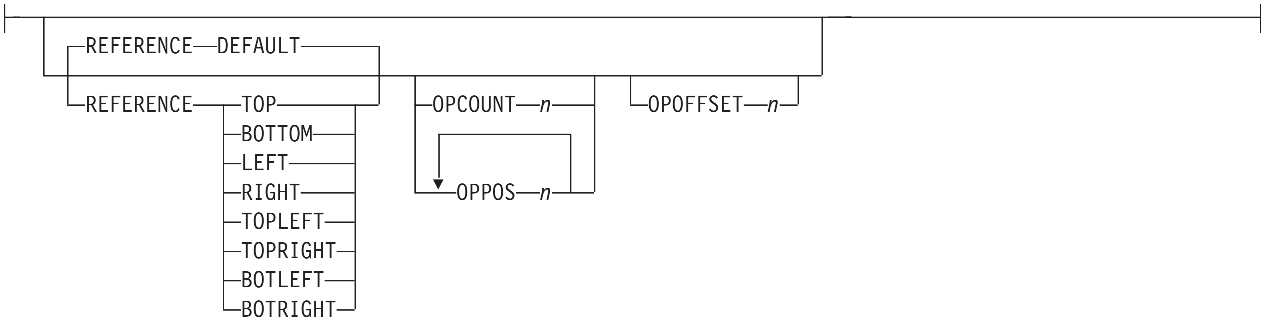
and parameters to be coded without having to install a new PPFA module. However, it also allows contextually incorrect operation and parameter values to be entered.

2. See Table 9 on page 241 for values of **XType** and **XOper**.

XType	Explicit Operation Type. Specify in hexadecimal or a decimal equivalent number the Finishing Operation Type. A value of 0 specifies a No Operation/Pass through paper operation. When 0 is coded in this field, the **XOper** field is ignored. Enter 2 hexadecimal digits or a decimal number less than or equal to 255.
XOper	Explicit Operation or Operation Parameter. Specify in hexadecimal or a decimal equivalent number the Finishing Operation Type. A value of X'FFFF' specifies the device default operation for the specified finishing operation for the specified Finishing Operation Type in the **XType** parameter. Enter 4 hexadecimal digits or a decimal number less than or equal to 65535.

Operation Parameters

More OPERATION parameters:



These operation parameters apply to both **AFP** and **UP3i** Operations with the noted exceptions

REFERENCE

Selects the reference edge or corner for the finishing operation. The **REFERENCE** subcommand is optional and, when omitted, the **DEFAULT** attribute is the default.

DEFAULT	Specifies that the device default edge determines the reference edge.
TOPLEFT	Specifies that the reference corner is positioned at the top in the left corner.

	This **REFERENCE** parameter can be used only for **CORNER** operations.
TOPRIGHT	Specifies that the reference corner is positioned at the top in the right corner. This **REFERENCE** parameter can be used only for **CORNER** operations.
BOTRIGHT	Specifies that the reference corner is positioned at the bottom in the right corner. This **REFERENCE** parameter can be used only for **CORNER** operations.
BOTLEFT	Specifies that the reference corner is positioned at the bottom in the left corner. This **REFERENCE** parameter can be used only for **CORNER** operations.
TOP	Specifies that the reference is positioned along the top edge.
BOTTOM	Specifies that the reference edge is positioned along the bottom edge.
RIGHT	Specifies that the reference edge is positioned along the right edge.
LEFT	Specifies that the reference edge is positioned along the left edge.

OPCOUNT *n*

Use **OPCOUNT** to request a specific number of finishing operations; valid values are 1-122. Do not specify **OPPOS** values with **OPCOUNT**. If **OPPOS** is specified for corner staple, separation cut, perforation cut, or fold, this **OPCOUNT** value is ignored. The printer determines the positions of the operations. The default is **0** (zero).

OPPOS *n*

Use **OPPOS** to specify the offset of finishing operations along the finishing operations axis measured from the point where the finishing operation axis intersects the bottom edge or left edge of the medium toward the center of the medium. Each consecutive **OPPOS** parameter is used to position a single finishing operation centered on the specified point on the finishing operation axis.

For **AFP** the sub-parameter is an integer value in the range of 0-32,767 specified in millimeters.

For **UP3i** the sub-parameter is an integer value in the range of 0 to 999999999 specified in millipoints (1/72000 inch).

Do not specify the unit of measure. Do not specify **OPCOUNT** when you use **OPPOS**. If **OPPOS** is specified for corner staple, fold, separation cut, or perforation cut, the **OPCOUNT** value is ignored.

OPOFFSET *n*

Specifies the offset of finishing operation axis from the reference edge measured from the reference edge toward the center of the medium.

For **AFP** the sub-parameter is an integer value in the range of 0-32,767 specified in millimeters.

For **UP3i** the sub-parameter is an integer value in the range of 0 to 999999999 specified in millipoints (1/72000 inch).Do not specify **OPOFFSET** for corner staple or saddle stitch; the corner staple or saddle stitch values are ignored when specified with **OPOFFSET**.

Table 9 shows how to specify finishing operations.

Table 9. XType and XOper values

XType Finishing Operation	XType Vale	XOper Finishing Operation Parameter	XOper Value
No Operation / Pass through paper	X'00'	Not applicable	
Paper Input / Page Interpose (not used for AFP/IPDS)	X'01'	Interpose from bin *xx* Stock Number	X'0001'—X'00FE'
		Default Bin/Stock	X'FFFF'
Fold	X'03'	Folding parameters from fold catalog	X'100D'
		No Fold	X'0000'
		Default	X'FFFF'
Staple / Stitch	X'04'	Corner Staple	X'0001'
		Saddle Stitch In	X'0002'
		Saddle Stitch Out	X'0003'
		Edge Stitch	X'0004'
		Default	X'FFFF'
Cut	X'05'	Separation Cut	X'0001'
		Perforation Cut	X'0002'
		Cross Cut	X'0003'
		Default	X'FFFF'
Trim	X'06'	Front Edge	X'0001'
		1 Edge	X'0002'
		3 Edge	X'0003'
		5 Edge	X'0004'
		Default	X'FFFF'
Offset / Group Separator / Job Separator	X'07'	Offset to Left	X'0001'
		Offset to Right	X'0002'
		Device Default	X'FFFF'
Stack	X'08'	Alternate Offset Stack	X'0001'
		Device Default	X'FFFF'

Table 9. XType and XOper values (continued)

XType Finishing Operation	XType Vale	XOper Finishing Operation Parameter	XOper Value
Rotate	X'09'	90° Clockwise	X'0001'
		180° Clockwise	X'0002'
		270° Clockwise	X'0003'
		Device Default	X'FFFF'
Punch	X'0A'	Round Hole	X'0001'
		Rectangular Hole	X'0002'
		Device Default	X'FFFF'
Bind	X'0B'	Device Default	X'FFFF'
Merge	X'0C'	Handle Most Left Page First	X'0001'
		Handle Most Right Page First	X'0002'
		Device Default	X'FFFF'
Banding	X'0D'	Single Band Wrap	X'0001'
		Double Band Wrap	X'0002'
		Crossing Band Wrap	X'0003'
		Device Default	X'FFFF'
Shrink Wrap	X'0E'	Shrink Wrap	X'0001'
		Device Default	X'FFFF'
Special Handling	X'F0'	Specific Parameter (undefined by UP3i)	X'0000'—X'FFFE'
		Not Applicable	X'FFFF'

Notes:

1. Your printer must have the appropriate finishing hardware to perform finishing operations.
2. The default **OPERATION** is **ZFOLD**, and the default **REFERENCE** is **DEFAULT**.
3. Your print server may have a limit on the number of collection operations that can be open at one time.
4. For the finishing operation, changing the orientation of the medium presentation space does not change the finishing position. For instance the finishing reference edge (corner) is not affected by **DIRECTION** or **PRESENT** values.
5. If more than one finishing operation is specified, the operations are applied in the order in which they are specified. Identical finishing operations for the same **SCOPE** are not supported.

The following are examples of finishing operations:

1. **ZFOLD** pages (for which the xyz **COPYGROUP** is in effect), specifying the left edge of the document as the reference edge:

```
COPYGROUP xyz
  FINISH OPERATION ZFOLD REFERENCE LEFT
    ;
```

2. Three examples of **ZFOLD** pages that specify the default edge of the document:

   ```
   COPYGROUP xyz FINISH;
   ```

   or

   ```
   COPYGROUP xyz FINISH OPERATION ZFOLD;
   ```

   or

   ```
   COPYGROUP xyz FINISH OPERATION ZFOLD REFERENCE DEFAULT;
   ```

3. An example of a **COPYGROUP** finishing command where **COPYGROUP** 1 begins the finishing collection for corner stapling, folding, and separation cut. **COPYGROUP** 2 continues the fold, cut, and corner operations and stops all other operations. **COPYGROUP** 3 continues any corner stapling, begins a new punch and fold group, and stops all other operations.

   ```
   COPYGROUP 1
       FINISH
        SCOPE BEGCOLL  OPERATION corner REFERENCE topleft
                       OPERATION fold
                       OPERATION cut;

     COPYGROUP 2
       FINISH
        SCOPE CONTCOLL OPERATION fold
                       OPERATION cut
                       OPERATION corner;

     COPYGROUP 3
       FINISH
        SCOPE CONTCOLL OPERATION corner REFERENCE topleft
        SCOPE BEGCALL  OPERATION punch
                       OPERATION fold;
   ```

4. An example of a **COPYGROUP** finishing command where **COPYGROUP** 1 begins a finishing collection for a punch, separation cut, and corner stapling (using the UP3i interface), and stops all other operations in progress. **COPYGROUP** 2 continues any UP3i corner stapling, but stops all other operations in progress. **COPYGROUP** 3 continues any UP3i corner stapling, stops all other operations in progress, and begins collecting sheets to punch and cut.

   ```
   FORMDEF FinXmp Replace Yes;

   COPYGROUP 1
       FINISH
        SCOPE BEGCOLL  OPERATION punch
                       OPERATION cut
                       OPERATION UP3i XType 4 XOper 1 REFERENCE topleft

     COPYGROUP 2
       FINISH
        SCOPE CONTCOLL OPERATION UP3i XType 4 XOper 1 REFERENCE topleft

     COPYGROUP 3
       FINISH
        SCOPE CONTCOLL OPERATION UP3i
                             UP3i XType X'04' XOper X'0001' REFERENCE topleft
        SCOPE BEGCALL  OPERATION AFP punch
                       OPERATION cut;
   ```

5. Examples of **COPYGROUP** finishing commands with **PRESENT** and **DIRECTION**:

```
FORMEDF MOGD01  replace yes
        PRESENT landscape   DIRECTION down ;
   COPYGROUP cg00
        PRESENT portrait    DIRECTION across ;

   COPYGROUP cg01
        PRESENT landscape   DIRECTION across ;

   COPYGROUP cg02
        PRESENT portrait    DIRECTION reverse ;

   COPYGROUP cg03
        PRESENT landscape   DIRECTION reverse ;

   COPYGROUP cg04
        PRESENT portrait    DIRECTION down ;

   COPYGROUP cg05
        PRESENT landscape   DIRECTION down ;
```

Finishing Operation Nesting Rules:

When more than one finishing operation involving a collection of media is specified for some portion of the print file, a nesting of the operations is defined first by the scope of the operation and second by the order of the operation in the data stream.

Finishing operations with a broader scope are nested outside of finishing operations with a narrower scope. The following scopes are listed in descending order:

1. Print-file level finishing (**SCOPE PRINTFILE**)
2. Document-level finishing, each document in the print file (**SCOPE ALL**)
3. Document-level finishing, a selected document in the **PRINTFILE** (**SCOPE** *n*)
4. Medium-map-level finishing, a collection of sheets (**SCOPE BEGCOLL**)

Finishing Operation Implementation Notes:

1. AFP environments limit the number of finishing operations that can be nested at the medium map (**COPYGROUP**) level. Check your PSF documentation for these limits.
2. In AFP environments, the nesting of identical finishing operations at the medium-map-level is not supported. Two finishing operations are identical if the **OPERATION**, **REFERENCE**, **OPCOUNT** or **OPPOS**, and **OPOFFSET** are the same.
3. For some printers, the **JOG** function cannot be combined with a finishing operation. In this case, the **JOG** function is ignored. Check your printer documentation.

ADJUST *n*

```
├──┬────────────┬──────────────────────────────────────────────────────────┤
   └─ADJUST──n──┘
```

Establishes the range of horizontal adjustment for the print area on the sheet.

n The adjustment range can be set from 0 to 20 L-units. After a value is set, it is the maximum amount available in both directions, plus and minus.[5]

Note: If you specify **ADJUST**, the maximum logical page size (in the horizontal direction) is reduced by the amount you specified here.

INVOKE

```
   ┌─INVOKE──SHEET──────┐
├──┤                    ├──────────────────────────────────────────────────────────┤
   └─INVOKE───┬─NEXT──┬─┘
              ├─FRONT─┤
              └─BACK──┘
```

Specifies where the next page of data is placed when this copy group is activated by conditional processing or by an Invoke Medium Map structured field.

INVOKE SHEET, which is the default, places the next page of data on a new sheet. The **NEXT**, **FRONT**, and **BACK** parameters place the next page in a subsequent partition on the same sheet or, if no partitions are available, on the next sheet. If **FRONT** or **BACK** is specified, **INVOKE** selects only partitions on the front or back, respectively.

The print server honors the **NEXT**, **FRONT**, and **BACK** values of the **INVOKE** subcommand only if the new copy group has the same medium modifications as the previous copy group. Some examples of medium modifications are duplexing, input bin, output bin, page offset, N_UP values, presentation, direction, medium (not page) overlays, text suppression, processing functions, print quality, finishing, jogging, and constant forms control. See the Media Eject Control Triplet (X'45') section in the *Mixed Object Document Content Architecture Reference*, SC31–6802 for a full description of the factors that allow a conditional eject to the next partition instead of the next sheet.

If any of these modifications differ, the print server ejects to a new sheet when the copy group is invoked. If you want to change overlays when ejecting to a new partition, use page overlays instead of medium overlays. See “Medium Overlays and Page Overlays” on page 169 for information about page and medium overlays.

When you use **PLACE** subcommands, the **NEXT**, **FRONT**, and **BACK** parameters place the next page using the next sequential **PLACE** subcommand that matches the requirement (next, front, or back). For example, if you print using the second **PLACE** subcommand of copy group A, and then you change to copy group B, you start with the third **PLACE** subcommand of copy group B.

A **CONSTANT** parameter on the **PLACE** subcommand does not alter the selection process. The selection is complete, even though the selected **PLACE** subcommand does not place the data. **N_UP** performs the constant modification and continues until it finds a

---

5. The **ADJUST** *n* subcommand used only on the IBM 3800 printers.

PLACE subcommand that does not specify **CONSTANT**. The data is placed with this subcommand. Observe that this **PLACE** subcommand need not match the **FRONT** or **BACK** specifications of the **INVOKE** subcommand.

SHEET	Specifies that data be placed in the first selected partition of the sheet.[4]
NEXT	Specifies that data be placed in the next selected partition.
FRONT	Specifies that data be placed in the next selected front partition.
BACK	Specifies that data be placed in the next selected back partition.

JOG

```
├──┬─────────────┬──────────────────────────────────────────────┤
   └─JOG──┬─YES─┬┘
          └─NO──┘
```

Specifies whether a **JOG** subcommand is sent to the printer when this **COPYGROUP** is selected by an IMM structured field, or through conditional processing. When the **JOG** subcommand is sent, a printer either offsets (jogs) or prints copymarks. For cut-sheet printers, or for continuous-forms printers with burster-trimmer-stacker enabled, the **JOG** subcommand causes the first sheet controlled by this **COPYGROUP** to be stacked offset from the previous sheets. For continuous forms printers without a burster-trimmer-stacker, the **JOG** subcommand causes an increment in the copymark printed on the carrier strip. **JOG** subcommands also are sent to the printer at the beginning of each data set or at the beginning of each job, depending on host parameters. For more information about copymarks, see the system programming guide for your host print server.

YES	Specifies that a **JOG** subcommand be sent to the printer. The first sheet printed is offset or the copymark is incremented.
NO	Specifies that no **JOG** subcommand be sent to the printer. The first sheet printed is not offset; the copymark is not incremented.

QUALITY *n*

```
├──┬─────────────┬──────────────────────────────────────────────┤
   └─QUALITY──n──┘
```

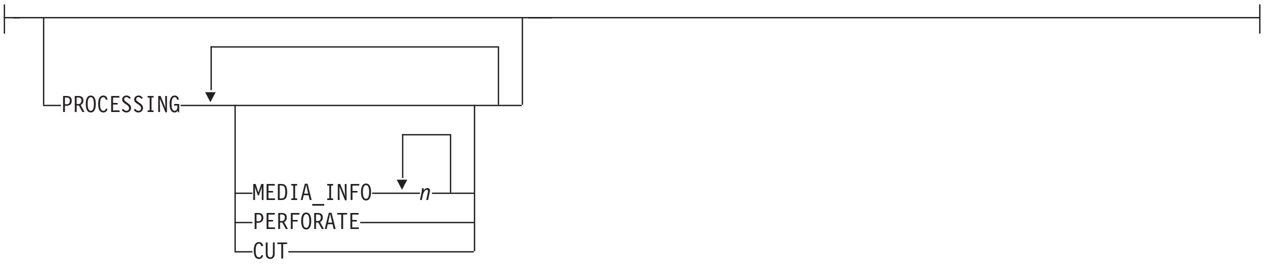
Specifies the print quality. This subcommand is recognized only on printers that can produce more than one level of print quality. The default is determined by the printer model. (On some printers, the default may be set at the printer itself.) For more information, refer to your printer publications.

n	You can select a level of print quality by entering any whole number from 1 to 10. Higher numbers correspond to higher levels of print quality; lower numbers correspond to lower levels. For more information, refer to your printer publications.

Print quality is determined by a numerical code in the range of 1 to 254 (hexadecimal X'01'–X'FE'). The codes corresponding to the possible **QUALITY** parameters are:

1 = 15 (X'0F')
2 = 40 (X'28')
3 = 65 (X'41')
4 = 90 (X'5A')
5 = 115 (X'73')
6 = 140 (X'8C')
7 = 165 (X'A5')
8 = 190 (X'BE')
9 = 215 (X'D7')
10 = 240 (X'F0')

PROCESSING



Specifies additional post processing capabilities for selected printers and attached equipment. This option can only be used on a single sheet or collection of sheets. This subcommand expects 1 to 3 of the following keywords:

MEDIA_INFO *n*

This parameter specifies the ID of fixed medium information that a printer or printer–attached device applies to a sheet. Examples include color plates logos, letter heads, and other fixed images.

The numeric values that can be included are:

0–254 These numeric values select a particular fixed medium local ID that the printer or printer–attached device applies to a sheet. One or more IDs can be specified within this range.

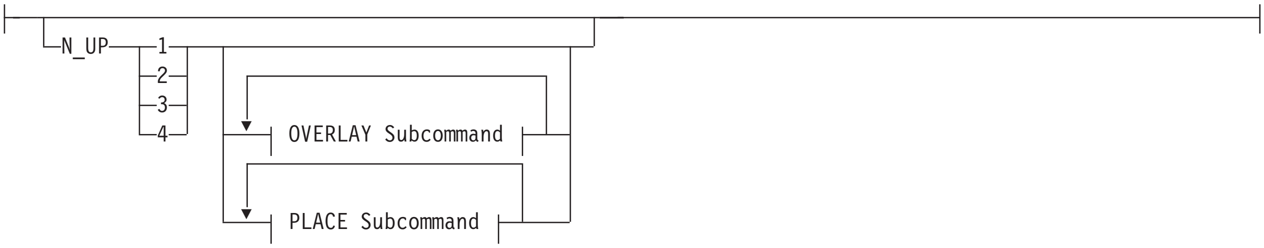
255 This value selects all the current fixed medium local IDs that the printer or printer–attached devices applies to a sheet.

PERFORATE Specifies a perforation cut at one or more fixed locations on the sheet according to the printer or printer–attached device.

CUT Specifies a separation cut at one or more fixed locations on the sheet according to the printer or printer–attached device.

N_UP { 1 | 2 | 3 | 4 }

COPYGROUP Command

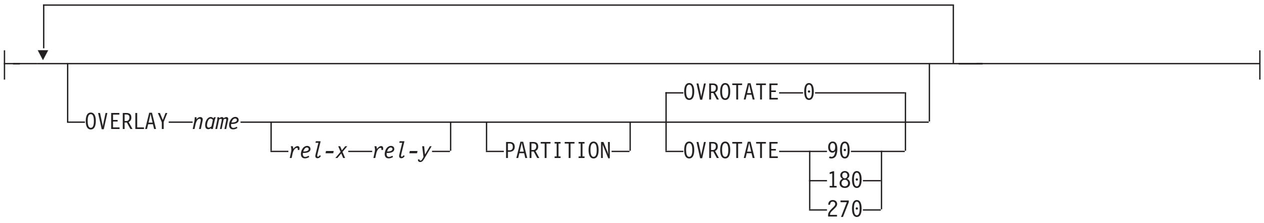


Specifies the number (**1**, **2**, **3**, or **4**) of equal-size partitions into which the sheet is divided. See the list of printers that support the **N_UP** subcommand.

If you do not specify the **N_UP** subcommand in the **COPYGROUP** command, the **N_UP** subcommand from the **FORMDEF** command is the default for the **COPYGROUP** command. You can mix **N_UP** printing and non-**N_UP** printing by specifying or not specifying the **N_UP** subcommand in each copy group and by *not* specifying **N_UP** in the **FORMDEF** command.

OVERLAY *name*

OVERLAY Subcommand:



Specifies the user access name (up to six characters) of an overlay to be placed with every page in each of the **N_UP** partitions. You can specify a maximum of 254 **OVERLAY** subcommands in a copy group.

Notes:

1. The prefix ‘O1’ is not part of the six-character user-access name. The overlay name can be an alphanumeric.
2. This name is not related to names as defined on the **OVERLAY** command.

rel-x rel-y	Specifies the horizontal and vertical adjustment to the position of the overlay. This is in addition to any offset values built into the overlay. The *x* and *y* values may be positive (+) or negative (–). You can specify them in inches (**IN**), millimeters (**MM**), centimeters (**CM**), **POINTS**, or **PELS**. If you do not specify a unit value, PPFA uses the unit value specified in the last **SETUNITS** command or uses a default unit value of inches.

Note: This **OVERLAY** subcommand cannot be specified if the **PLACE** subcommand is specified.

PARTITION
Specifies that the overlay is to be placed relative to the partition origin.

OVROTATE
Specifies the rotation of the placed overlay with respect to the x-axis of the page.

Example: Assuming the overlay has (0,0) placement coordinates, this causes page overlay “01x2” to be placed 1.5 inches to the right and 2.7 inches below the beginning of the page and rotated 90 degrees clockwise with respect to the page.

```
Formdef xmp1
    N_UP 1   PLACE 1 FRONT
             OVERLAY x2  1.5 in
             OVROTATE 90;
```

PLACE

PLACE Subcommand:

```
├──┬─────────────────────────────────────────────────────────────────────────────────────────────────────────────────────────────────────┬────┤
   │       (1)       ┌─FRONT─┐                                                                       ┌─ROTATION──0─────┐  ┌─VIEW──YES─┐  │
   └─PLACE───────n───┤       ├──┬──────────┬──┬───────────────────────┬──┬────────────────────────┬──┤                 ├──┤           ├──┘
                     └─BACK──┘  └─CONSTANT─┘  └─OFFSET──rel-x──rel-y──┘  └─┤ OVERLAY Subcommand ├─┘  └─ROTATION──┬─90──┤  └─VIEW──NO──┘
                                                                                                                 ├─180─┤
                                                                                                                 └─270─┘
```

Notes:

1 The use of the **PLACE** subcommand indicates enhanced **N_UP** printing.

Places a page of data or a constant modification relative to a partition. Each **PLACE** subcommand specifies the number *n* of a partition on either the front or back side of the sheet. **FRONT** is the default, if you do not specify this subcommand. You must specify the same number of **PLACE** subcommands as the number of partitions on the sheet. The sequence of the **PLACE** subcommands is the sequence in which incoming pages are placed in the partitions.

Note: The **PLACE** subcommand is valid only on printers that support enhanced **N_UP**

printing. If **PLACE** is not specified, pages are placed in partitions in the default partition sequence.

n Specifies the numbered partition (1–4) into which the page of data is placed. See Figure 71 on page 148 through Figure 74 on page 150 for the locale of each numbered partition.

FRONT Specifies that this partition be placed on the front side of the sheet.

BACK Specifies that this partition be placed on the back side of the sheet.

CONSTANT Specifies that no page data is placed by this **PLACE** subcommand.

Use **CONSTANT** when you are placing overlays without user's data or are placing fewer data pages on the sheet than the number of partitions specified in the **N_UP** subcommand.

For an example of using the **CONSTANT** parameter with overlays and to understand how the ordering of the **PLACE** subcommand affects overlays, see "Enhanced N_UP Example 3: Asymmetric Pages" on page 167.

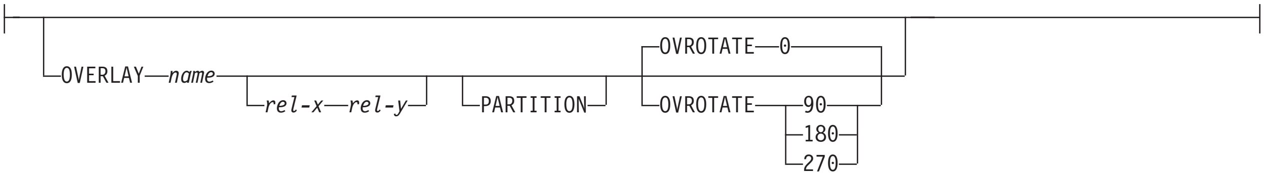
OFFSET Specifies a relative offset of the page horizontally (*x*) and vertically (*y*) from the partition origin.

rel-x rel-y The default value is 0.1 inch for both *x* and *y* offsets. This **OFFSET** parameter overrides any other **OFFSET** parameters specified on the **FORMDEF** or **COPYGROUP** command. You can specify the units in inches (in), millimeters (mm), centimeters (cm), points, or pels. If you do not specify a unit value, PPFA uses the unit value specified in the last **SETUNITS** command or uses a default unit value of inches.

Note: You may specify this offset as negative in order to crop the top and/or left of an image.

OVERLAY *name*

OVERLAY Subcommand:



Specifies the user access name (up to six characters) of an overlay to be placed with this **PLACE** subcommand. The overlay is placed relative to the page origin or, if the **PARTITION** keyword is specified, to the partition origin. You can specify multiple **OVERLAY** parameters in each **PLACE** subcommand.

Note: This **OVERLAY** subcommand cannot be specified if the **PLACE** subcommand is specified.

rel-x rel-y Specifies the horizontal and vertical adjustment to the position of the overlay. This is in addition to any offset values built into the overlay. The *x* and *y* values may be positive (+) and negative (–). You can specify them in inches (in), millimeters (mm), centimeters (cm), points, or pels. If you do not specify a unit value, PPFA uses the unit value specified in the last **SETUNITS** command or uses a default value of inches.

PARTITION Specifies that the previous offset is from the partition origin. If not present, the offset is from the page origin, which is subject to the **OFFSET** parameter.

OVROTATE { 0 | 90 | 180 | 270 }
Specifies the rotation of the placed overlay with respect to the *x-axis* of the page.

ROTATION { 0 | 90 | 180 | 270 }
Specifies the clockwise rotation of the page and associated page overlays placed by this **PLACE** command.

Rotation turns the page and its associated page overlays around their fixed origin points. If you rotate the page without moving its origin point, you might rotate it off the physical medium. To prevent this, always offset the page origin to the place you want it to be for the rotated page, as shown in Figure 105 on page 253.

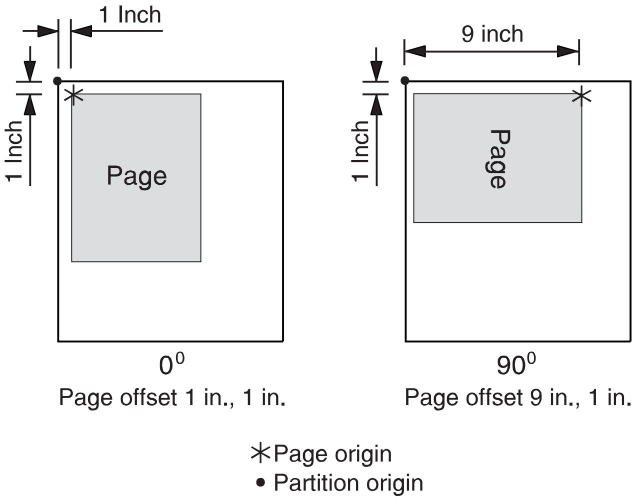


Figure 105. Offsetting the Page Origin for Rotated Pages

VIEW
Determines if this **N_UP PLACE** page is viewable. **VIEW** is relevant only when the page is being presented on a display. **VIEW** is ignored if the page is being printed. If **VIEW** is not coded, it is equivalent to specifying **VIEW YES**.

YES Specifies that this **N_UP** page is viewable and is presented.

NO Specifies that this **N_UP** page is not to be presented.

PELSPERINCH *n*

```
├──┬──────────────────┬──────────────────────────────────────────────────────────────┤
   └─PELSPERINCH──n───┘
```

Specifies the Logical Units in pels per inch for this **COPYGROUP**. Use the **PELSPERINCH** parameter to tell PPFA the pel resolution of your printer to generate more exact object placements.

n Specifies an integer number between 1 and 3,276, which determines the Logical Units in pels per inch.

Note: If the L-Units are not specified on the copy group, they are inherited from the form definition. See Figure 106 on page 279 for more information.

form-size

Form-size Subcommand:

```
├──┬─────────────────────────┬──┬─────────────────────────┬──────────────────────────┤
   └─XMSIZE──x──┬─────────┬──┘  └─YMSIZE──y──┬─────────┬──┘
                └─units───┘                  └─units───┘
```

Specifies the medium presentation space (also known as the medium size or form length and form width).

Notes:

1. This function requires both printer server and printer support. See your print server and printer documentation.
2. The printer will not adjust the size of your media-presentation space to be larger than the paper size (or what has been defined in the printer as the paper size).
3. Some printers (such as the InfoPrint 1145 and the InfoPrint 4100) do not support the IPDS "Set Media Size" (SMS) command. The form size cannot be set with the form definition. **Do not use the XMSIZE and YMSIZE subcommands for those printers which do not support the SMS commands.**
4. Other printers (such as the 6400, 4247, and 4230) do not support the "Set Media Origin" (SMO) command. The media origin does not change. **For the 6400, 4247, and 4230 printers form length is always YMSIZE and form width is always XMSIZE.**
5. For all other printers, use the settings shown in Table 10 on page 255. For these other printers, whether the **XMSIZE** or **YMSIZE** is actually form length or form width depends on the medium presentation space orientation, type of form, and NUP setting. The following examples are from Table 10 on page 255. See the table for other media combinations.
   - Wide fanfold paper, **PRESENT**=Landscape, **DIRECTION**=**ACROSS**, and no-**NUP** - The form length is **YMSIZE**.
   - Narrow fanfold paper, **PRESENT**=Landscape, **DIRECTION**=**ACROSS**, and no-**NUP** - The form length is **XMSIZE**.
   - Cutsheet paper, **PRESENT**=Landscape, **DIRECTION**=**ACROSS**, and no-**NUP** - The form length is **XMSIZE**.
6. **There are only two choices. If you try one that doesn't work, try the other.** For example, if you try **XMSIZE** for the form length and it doesn't create a longer form, use **YMSIZE**.

XMSIZE

This specifies the medium presentation space along the X-axis (also known as the medium's size in the X-direction). If this subcommand is specified on the **FORMDEF** command, it becomes the default for all copygroups which do not specify **XMSIZE** on the **COPYGROUP** command. If this subcommand is not specified on the **FORMDEF** command, the printer's current default X-axis becomes the default for all copygroups which do not specify **XMSIZE** on the **COPYGROUP** command.

x Enter a number with 0 to 3 decimal places and optional units.

YMSIZE

This specifies the medium presentation space along the Y-axis (also known as the medium's size in the Y-direction). If this subcommand is specified on the **FORMDEF** command, it becomes the default for all copygroups which do not specify

YMSIZE on the **COPYGROUP** command. If this subcommand is not specified on the **FORMDEF** command, the printer's current default Y-axis becomes the default for all copygroups which do not specify **YMSIZE** on the **COPYGROUP** command.

y
Enter a number with 0 to 3 decimal places and optional units.

units
Enter **IN** for inches, **CM** for centimeters, **MM** for millimeters, or **PELS** for pels. If *units* is not specified, the default is to the most recent setting of the **SETUNITS** command or inches if no **SETUNITS** command is coded.

Table 10. Form Length (LEN) and Form Width (WID)

CUTSHEET and NARROW FANFOLD PAPER												
DIRECTION	**ACROSS**				**DOWN**				**REVERSE**			
PRESENT	**Portrait**		**Landscape**		**Portrait**		**Landscape**		**Portrait**		**Landscape**	
	LEN	**WID**	**LEN**	**WID**	**LEN**	**WID**	**LEN**	**WID**	**LEN**	**WID**	**LEN**	**WID**
No NUP	Ym	Xm	Xm	Ym	Xm	Ym	Ym	Xm	Ym	Xm	Xm	Ym
1-UP	Ym	Xm	Xm	Ym	Xm	Ym	Ym	Xm	Ym	Xm	Xm	Ym
2-UP	Xm	Ym	Ym	Xm	Ym	Xm	Xm	Ym	Xm	Ym	Ym	Xm
3-UP	Xm	Ym	Ym	Xm	Ym	Xm	Xm	Ym	Xm	Ym	Ym	Xm
4-UP	Ym	Xm	Xm	Ym	Xm	Ym	Ym	Xm	Ym	Xm	Xm	Ym
WIDE FANFOLD PAPER												
DIRECTION	**ACROSS**				**DOWN**				**REVERSE**			
PRESENT	**Portrait**		**Landscape**		**Portrait**		**Landscape**		**Portrait**		**Landscape**	
	LEN	**WID**	**LEN**	**WID**	**LEN**	**WID**	**LEN**	**WID**	**LEN**	**WID**	**LEN**	**WID**
No NUP	Xm	Ym	Ym	Xm	Ym	Xm	Xm	Ym	Xm	Ym	Ym	Xm
1-UP	Xm	Ym	Ym	Xm	Ym	Xm	Xm	Ym	Xm	Ym	Ym	Xm
2-UP	Ym	Xm	Xm	Ym	Xm	Ym	Ym	Xm	Ym	Xm	Xm	Ym
3-UP	Ym	Xm	Xm	Ym	Xm	Ym	Ym	Xm	Ym	Xm	Xm	Ym
4-UP	Xm	Ym	Ym	Xm	Ym	Xm	Xm	Ym	Xm	Ym	Ym	Xm

Code Examples

```
FORMDEF FMSZX1   Replace Yes
    PRESENT Landscape Direction Across
    XMSIZE 8.5 in YMSIZE 11.0 in;
 COPYGROUP cp1;
 COPYGROUP cp2;

FORMDEF FMSZX2   Replace Yes YMSIZE 17.0 in;
 COPYGROUP cp3;
 COPYGROUP cp4;
```

In the previous example:

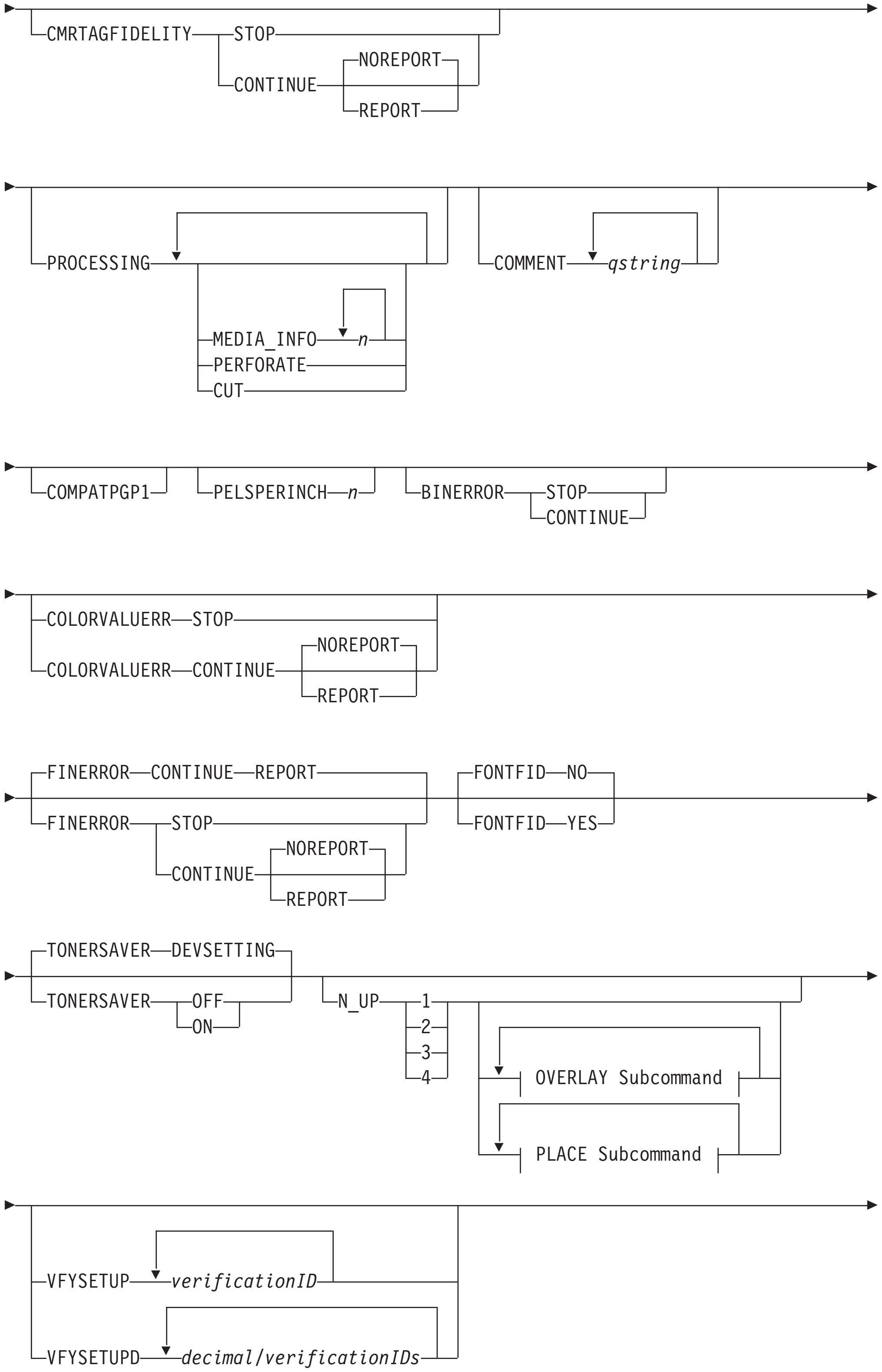
- The printer is a 4400 thermal printer which supports both SMS and SMO IPDS commands. The form definition named FMSZX1 defines a form length of 8.5 inches and form width of 11.0 inches. Copygroups "cp1" and "cp2" inherit those sizes from the form definition.

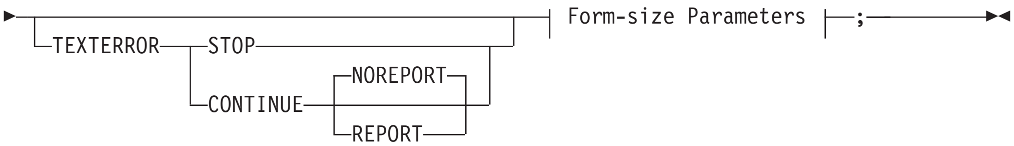
- The printer is a 6400 printer and you want to define the form length. The form definition named FMSZX2 defines form length as 17 inches and leaves the form width as the printer default. Copygroups “cp3” and “cp4” inherit those sizes from the form definition.
- If this is run on an MVS platform which has FORMLEN defined in the JCL, the JCL definition is used.

FORMDEF Command

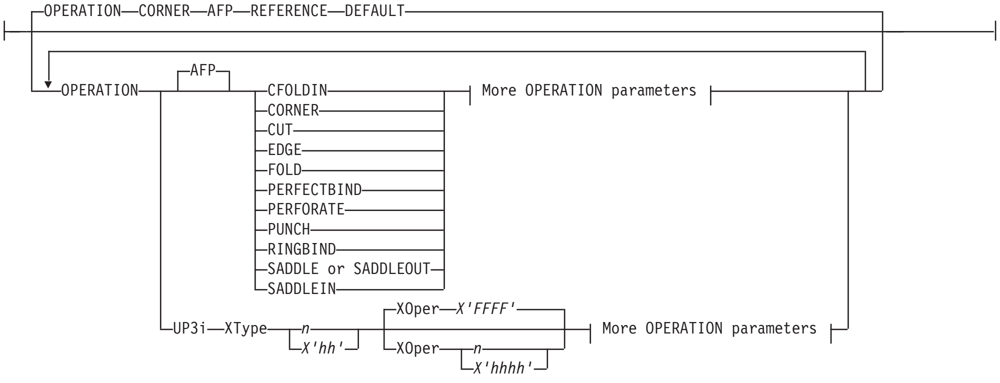
FORMDEF Command

```
►►──FORMDEF──name──┬──────────────────────────────────────────────┬──────────►
                   └─OFFSET──rel-x - rel-y──┬──────────────────┬──┘
                                            └─rel-x - rel-y────┘


   ┌─REPLACE──NO──┐
►──┼──────────────┼──────────────────────────────────────────────────────────►
   └─REPLACE──YES─┘

   ┌─BIN──1──────────────────────────────────────────────────────────┐
►──┼─────────────────────────────────────────────────────────────────┼───────►
   └─BIN──────┬──────────┬──┬───────────────────┬──┬─────────────┬───┘
              ├─n────────┤  └─MEDIANAME──qstring─┘  └─COMPID──m───┘
              ├─MANUAL───┤
              └─ENVELOPE─┘

                                                  ┌─CUTSHEET──NO──┐
►──┬──────────┬──┬──────────────────────────┬──┼───────────────┼─────────────►
   └─OUTBIN──n─┘  └─CONSTANT──┬─NO─────┬─────┘  └─CUTSHEET──YES─┘
                             ├─BACK───┤
                             ├─FRONT──┤
                             └─BOTH───┘

►──┬──────────────────────────────┬──┬───────────────────────────┬───────────►
   └─DIRECTION──┬─ACROSS──┬───────┘  └─DUPLEX──┬─NO──────┬───────┘
                ├─DOWN────┤                    ├─NORMAL──┤
                └─REVERSE─┘                    ├─TUMBLE──┤
                                               ├─RNORMAL─┤
                                               └─RTUMBLE─┘


►──┬─────────────────────────────┬───────────────────────────────────────────►
   └─PRESENT──┬─PORTRAIT───┬─────┘
              └─LANDSCAPE──┘


►──┬────────────────────────────────────────────────────────────────┬────────►
   │            ┌───────────────────────────────────────────────┐  │
   └─FINISH─────▼─┬─SCOPE──PRINTFILE─┬──┤ OPERATION Parameters ├─┴──┘
                  └─SCOPE──┬─ALL─┬───┘
                           └─n───┘


                  ┌─INVOKE──SHEET──────┐
►──┬───────────┬──┼────────────────────┼──┬────────────────┬──┬─────────────┬──►
   └─ADJUST──n─┘  └─INVOKE──┬─NEXT───┬─┘  └─JOG──┬─YES─┬──┘  └─QUALITY──n──┘
                            ├─FRONT──┤           └─NO──┘
                            └─BACK───┘
```

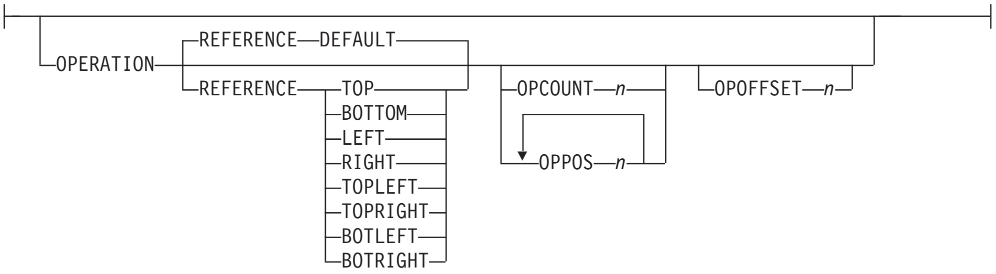

CMRTAGFIDELITY
STOP
CONTINUE
NOREPORT
REPORT
PROCESSING
MEDIA_INFO
n
PERFORATE
CUT
COMMENT
qstring
COMPATPGP1
PELSPERINCH
n
BINERROR
STOP
CONTINUE
COLORVALUERR
STOP
COLORVALUERR
CONTINUE
NOREPORT
REPORT
FINERROR
CONTINUE
REPORT
FINERROR
STOP
CONTINUE
NOREPORT
REPORT
FONTFID
NO
FONTFID
YES
TONERSAVER
DEVSETTING
TONERSAVER
OFF
ON
N_UP
1
2
3
4
OVERLAY Subcommand
PLACE Subcommand
VFYSETUP
verificationID
VFYSETUPD
decimal/verificationIDs



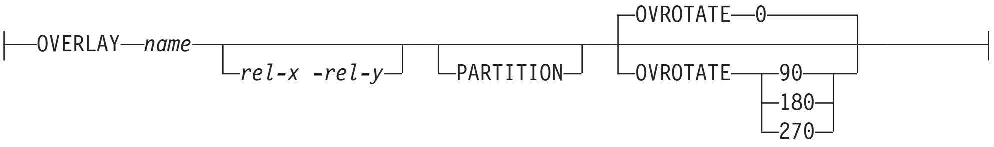
OPERATION Parameters:



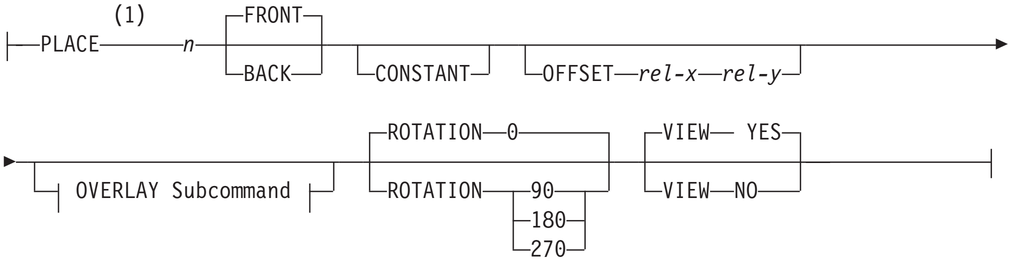
More OPERATION Parameters:



OVERLAY Subcommand:



PLACE Subcommand:



Form-size Parameters:

```
├──┬────────────────────┬──┬────────────────────┬──────────────┤
   └─XMSIZE─x─┬───────┬─┘  └─YMSIZE─y─┬───────┬─┘
              └─units─┘               └─units─┘
```

Notes:

1 The use of the **PLACE** subcommand indicates enhanced **N_UP** printing.

A form definition is a resource that contains all the controls relating to the physical sheet. A **FORMDEF** command must be specified when you define a new form definition. When subcommands (except for the **REPLACE**, **PRESENT**, and **DIRECTION** subcommands) are specified, they become the defaults for all **COPYGROUP** commands nested within this form definition.

FORMDEF	Identifies the form definition to be used with the print job.
name	Defines an alphanumeric name of 1–8 characters for the form definition. When you create a form definition, PPFA assigns a prefix of F1 to the name you specify. F1*nnnnnn* is the external resource name in the form-definition library.

Subcommands

OFFSET

```
├──┬──────────────────────────────────────────┬──────────────┤
   └─OFFSET─rel-x - rel-y─┬──────────────────┬┘
                          └─rel-x - rel-y─┘
```

Specifies the offset of the logical page for both the front and back pages in reference to the media origin. The media origin is printer dependent. For more information about media origin, see your printer publications or *Advanced Function Presentation: Printer Information*.

If you specify offset values for the back of the page, you must also specify the front offset values.

Notes:

1. The **OFFSET** subcommand does not affect the position of medium overlays.
2. You may specify this offset as negative in order to crop the top and/or left of an image.

rel-x Specifies the relative horizontal offset (negative or positive) of the logical page on the front or back side of the copy group relative to the media origin. The valid options for *rel-x* are described in the **SETUNITS** command for the horizontal value.

The default unit is:
- Taken from the last **SETUNITS** command
- **IN** (inch) if no **SETUNITS** command has been issued
- 0.1 IN

rel-y Specifies the relative vertical offset (negative or positive) for the logical page for the front or back side of the page.

The valid options for *rel-y* are described in the **SETUNITS** command for the vertical value.

The default unit is:
- Taken from the last **SETUNITS** command
- **IN** (inch) if no **SETUNITS** command has been issued
- 0.1 IN

Note: The vertical offset for the 3800 must be 0.5 inch or greater.

REPLACE

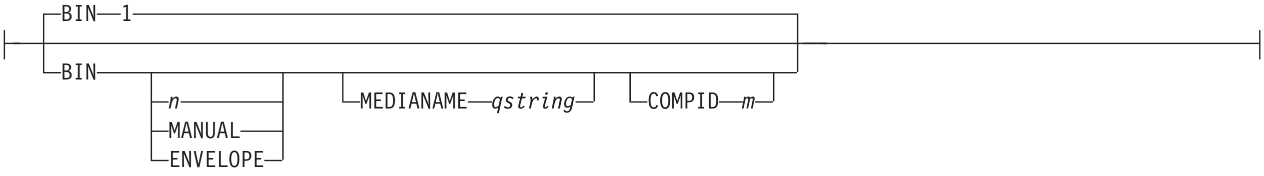
Specifies whether this form definition is to replace an existing one with the same resource name in the library.

YES Replace an existing form definition of the same name in the library if there is one. If a form definition with the same name does not exist in the library, then store this form definition.

NO Do not replace an existing form definition of the same name. If a form definition with the same name does not exist in the library, then store this form definition.

This is the default.

BIN



Specifies which paper source is to be used on printers with more than one paper source. The value range is 1–255. (This subcommand should be used only for printers that have more than one paper source.)

Note: If you specify the **BIN** subcommand, you must also specify at least one of the legal parameters.

n	An integer number between 1 and 255 that is the Media Source Id (also known as the bin number).
1	Selects the primary paper source.
2–255	Selects another paper source. If the specified bin does not exist on your printer, the default paper source for that printer is used. For more information about paper sources on your printer, refer to your printer publications. Using a value of *100* is the same as specifying **MANUAL**.
MANUAL	Selects manual feed as a paper source on those

printers that support manual feed. For more information, refer to your printer publications.

ENVELOPE Selects an envelope paper source on those printers that support this function. For more information, refer to your printer documentation.

MEDIANAME
Selects a media source by specifying an agreed upon name for the bin. For a list of the valid media names, see Appendix G, "PPFA Media Names," on page 611.

qstring Up to 12 characters within single quotes specifying the media source name. On some printers, this name is pre-set into the printer; on others, it also can be entered into the printer by the user. Refer to your printer documentation for further information.

COMPID *m* Selects a bin based on the component id.

Note: For a current list of component ids, see Appendix G, "PPFA Media Names," on page 611. Component ids from 12,288 to 268,435,455 are reserved for the user.

Notes:

1. **BIN** selection is overridden by the printer if the form defined to each bin is the same form number. Only the primary bin is selected.
2. The primary source usually contains either letter-size (U.S.) or A4 (I.S.O.) paper. Other paper sources are used for less common paper sizes (such as legal-size) and for special paper (such as colored stock or pre-printed letterhead on heavy bond).
3. If duplexing is requested and you select from the front side from one bin and the back side from another bin, a warning message is issued and the printer takes the paper from the bin specified on the front side.

OUTBIN *n* Specifies the destination bin number for any pages directed by this form definition. Copygroups and subgroups in this form definition that do not specify an output bin number inherit this bin number.

n

```
├──┬─────────────┬──────────────────────────────────────────────────────┤
   └─OUTBIN──n───┘
```

Specifies the output bin number.

CONSTANT

```
├──┬─────────────────────┬──────────────────────────────────────────────────────┤
   └─CONSTANT──┬─NO────┬─┘
               ├─BACK──┤
               ├─FRONT─┤
               └─BOTH──┘
```

Specifies whether the constant-forms function is on or off and whether constant form is to be printed on the front or back sides of a sheet.

NO	Specifies that the constant forms function is off.
BACK	Specifies that a constant form is to be printed on the back side without variable data.
FRONT	Specifies that a constant form is to be printed on the front side without variable data.
BOTH	Specifies that a constant form is to be printed on both sides without variable data.

CUTSHEET

```
   ┌─CUTSHEET──NO──┐
├──┴───────────────┴──────────────────────────────────────────────────────────────┤
   └─CUTSHEET──YES─┘
```

If you are using a cut-sheet printer, this subcommand specifies whether the medium orientation information, which is coded using the **DIRECTION** and/or **PRESENT** subcommands, is to be passed to that printer. Not coding the **CUTSHEET** subcommand is equivalent to coding **CUTSHEET NO**.

NO	Specifies the rotation data is not to be passed unless, of course, **N_UP** is coded.
YES	Specifies the rotation data is to be passed.

Note: **As always:** If you have a continuous form printer, the medium orientation information is passed. If you have a cut-sheet printer and **N_UP** is coded, the orientation information is passed. The default for a **COPYGROUP** for which no **CUTSHEET** subcommand is coded is to inherit the behavior of the **FORMDEF**.

New: If you have a cut-sheet printer and **CUTSHEET YES** is coded, the orientation information is passed if you also have a level of print server that supports the **CUTSHEET** feature.

In all cases: Before using this command, you must have a printer that allows its media origin to be changed.

DIRECTION

```
├──┬─────────────────────────┬────────────────────────────────────────────────────┤
   └─DIRECTION──┬─ACROSS──┬─┘
                ├─DOWN────┤
                └─REVERSE─┘
```

Determines, along with the **PRESENT** subcommand, how data is oriented on printers whose media origin can be changed. See the

list of printers under the **PRESENT** subcommand.
If you are printing line data, you usually specify the same value for the **DIRECTION** subcommand as is specified for the **DIRECTION** subcommand in the page definition.

ACROSS	Specifies that the pages are formatted in the **ACROSS** printing direction.
DOWN	Specifies that the pages are formatted in the **DOWN** printing direction.
REVERSE	Specifies that the pages are formatted in the **REVERSE** printing direction.

If the **DIRECTION** subcommand is specified, you must specify the **PRESENT** subcommand. The default for **DIRECTION** is determined by the value specified for **PRESENT**.

The direction default of **PORTRAIT** is **ACROSS**; the direction default of **LANDSCAPE** is **DOWN**. If neither **PRESENT** nor **DIRECTION** is specified, the default is **PRESENT PORTRAIT** and **DIRECTION ACROSS**.

Examples of **FORMDEF** finishing commands with **PRESENT** and **DIRECTION**:

```
FORMDEF fd00
     PRESENT portrait    DIRECTION across ;

FORMDEF fd01
     PRESENT landscape   DIRECTION across ;

FORMDEF fd02
     PRESENT portrait    DIRECTION reverse ;

FORMDEF fd03
     PRESENT landscape   DIRECTION reverse ;

FORMDEF fd04
     PRESENT portrait    DIRECTION down ;

FORMDEFP fd05
     PRESENT landscape   DIRECTION down ;
```

DUPLEX

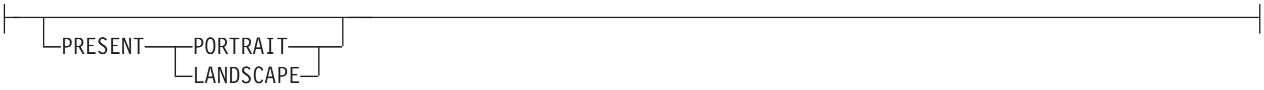
```
├──┬──────────────────────┬──────────────────────────────────────────────────────┤
   └─DUPLEX──┬─NO───────┬─┘
             ├─NORMAL───┤
             ├─TUMBLE───┤
             ├─RNORMAL──┤
             └─RTUMBLE──┘
```

Specifies whether printing is done on both sides of the sheet. This subcommand should be used only for page printers that have duplex capability.

NO	Duplex printing is not performed.
NORMAL	Duplex printing is performed, with the tops of both sides printed along the same edge for side binding.
TUMBLE	Duplex printing is performed with the top of one

	side and the bottom of the other printed along the same edge of the sheet for top binding.
RNORMAL	Rotated normal. Duplex printing is performed with the top of one side printed along the same edge of the sheet as the bottom of the other. Used with landscape pages, **N_UP 2**, and **N_UP 3**.
RTUMBLE	Rotated tumble. Duplex printing is performed with the tops of both sides printed along the same edge. Used with landscape pages, **N_UP 2**, and **N_UP 3**.

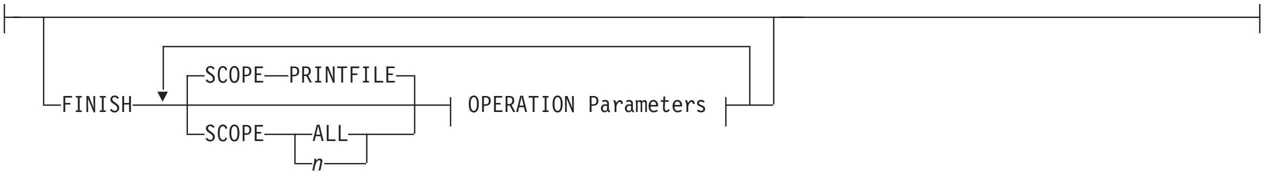
PRESENT



Specifies, along with the **DIRECTION** subcommand, how the data is oriented on printers whose media origin can be changed. The **PRESENT** and **DIRECTION** subcommands are only supported by cut-sheet printers when you specify the **N_UP** subcommand or the **CUTSHEET** subcommand with the **YES** parameter. See Figure 71 on page 148 through Figure 74 on page 150 to determine the effect of the **PRESENT** and **DIRECTION** subcommands when you use them with the **N_UP** subcommand.

PORTRAIT	Specifies that the pages are printed in the portrait page presentation, with their short edges at the top and bottom and their long edges at the sides.
LANDSCAPE	Specifies that the pages are printed in the landscape page presentation, with their long edges at the top and bottom and their short edges at the sides.

FINISH



Specifies where the media should be stapled, folded, cut, or perforated.

This option can only be used on a document, set of documents, or an entire print file. Finishing operations are device dependent; check your printer documentation before using the **FINISH** subcommand.

Notes:

1. The **FINISH** operation is used for printers with finisher attachments.
2. The finishing operation must be specified at least once, and may occur more than once. It specifies finishing operations to be applied to the collected media.

3. If more than one finishing operation is specified, the operations are applied in the order in which they are specified. Identical finishing operations for the same **SCOPE** are not supported.
4. **FINISH** positions are not affected by **DIRECTION** or **PRESENT** values.
5. Changing the orientation of the medium presentation space does not change the finishing corners or edges.
6. For continuous forms media, the carrier strips are not considered to be part of the physical media.
7. For saddle stitch operation, the staples are placed along the center of the media, parallel to the reference edge. Any offset value is ignored. If no **OPCOUNT** or **OPPOS** values are specified, the device default count is used.
8. User-specified **OPCOUNT** and **OPPOS** values are ignored for **FOLD**, **CUT**, or **PERFORATE** operations.

SCOPE Determines how the finishing operation is applied.

Note: **SCOPE** can be repeated within a **FINISH** subcommand, but only one **SCOPE** of a particular type is allowed for each **FORMDEF** command. For example, only one **SCOPE ALL** is allowed for each **FORMDEF FINISH** command.

PRINTFILE
Determines that the specified finishing operations for the **OPERATION** subcommand are applied to the complete print file, excluding header pages, trailer pages, and message pages.

ALL Determines that the specified finishing operations for the **OPERATION** subcommand are applied individually to all documents in the print file.

n Use the *n* to apply the finishing operation to a specific document. Use a value of 1 to apply the finishing operation to the first document in a print file. Use the value 2 to apply the finishing operation to the second document in a print file, and so on. The range of values includes 1-32,767.

OPERATION

OPERATION Parameters:

```
   ┌─OPERATION──CORNER──AFP──REFERENCE──DEFAULT──────────────────────────────────────────────┐
├──┼──────────────────────────────────────────────────────────────────────────────────────────┼──────────┤
   │ ┌──────────────────────────────────────────────────────────────────────────────────────┐ │
   │ ▼          ┌─AFP─┐                                                                      │ │
   └──OPERATION─┴─────┴──┬─CFOLDIN────────────┬─┤ UP3i parameters ├─┤ More OPERATION parameters ├─┴─┘
                         ├─CORNER─────────────┤
                         ├─CUT────────────────┤
                         ├─EDGE───────────────┤
                         ├─FOLD───────────────┤
                         ├─PERFECTBIND────────┤
                         ├─PERFORATE──────────┤
                         ├─PUNCH──────────────┤
                         ├─RINGBIND───────────┤
                         ├─SADDLE or SADDLEOUT┤
                         └─SADDLEIN───────────┘
```

Specifies the type of finishing operation and parameters for that operation.

Notes:

1. Compatible Operations can be repeated within a specified **SCOPE**.
2. Your print server may have a limit on the number of collection operations allowed to be active at one time.

AFP

Specifies that these are Advanced Function Presentation (AFP) operations as defined in the *Mixed Object Document Content Architecture Reference*, SC31-6802 and the *Intelligent Printer Data Stream Reference*, S544-3417.

CFOLDIN

Center Fold In. Specifies that the media is folded inward along the center line that is parallel to the finishing operation axis. After this operation, the back side of the last sheet of the collection is on the outside. The **OPCOUNT** and **OPPOS** parameters are ignored for this operation. **CFOLDIN** is applied to collected media, not to individual media.

Note: Pages of the datastream must already be properly ordered for this operation.

CORNER

Specifies that one staple is driven into the media at the reference corner (see **REFERENCE** parameter). For corner staples, the offset and angle of the staple from the selected corner is device dependent. The **OPOFFSET**, **OPCOUNT**, and **OPPOS** parameters are ignored for this operation. This operation is applied to collected media, not to individual media.

CUT

Specifies that a separation cut is applied to the media along the axis of the finishing operation. The **OPCOUNT** and **OPPOS** parameters are ignored for this operation.

EDGE	Specifies that one or more staples are driven into the media along the axis of the finishing operation. This operation is applied to collected media, not to individual media.
FOLD	Specifies that the media is folded inward on the front sheet side of the first sheet of the collection. The folding is performed along the axis of the finishing operation. The **OPOFFSET** and **OPPOS** parameters are ignored for this operation. This operation is applied to collected media, not to individual media.
PERFECTBIND	This operation specifies a type of book binding that glues the sheets of the group together at the reference edge (spine). When you specify **PERFECTBIND**, the **OPOFFSET**, **OPCOUNT**, and **OPPOS** parameters are ignored.
PERFORATE	Specifies that a perforation cut is applied to the media along the axis of the finishing operation. The **OPOFFSET** and **OPPOS** parameters are ignored for this operation.
PUNCH	Specifies that one or more holes are to be punched or drilled into the media along the finishing axis. **PUNCH** is applied to he collected media, not to individual media.
RINGBIND	This operation specifies a type of book binding when the sheets of the group are loosely connected at the reference edge (spine) by first drilling or punching a set of holes along the reference edge and then inserting a wire pattern through the holes. When you specify **RINGBIND**, the **OPOFFSET**, **OPCOUNT**, and **OPPOS** parameters are ignored.
SADDLE (same as SADDLEOUT)	Specifies that one or more staples are driven into the media along the

axis of the finishing operation, which is positioned at the center of the media, parallel to the reference edge (see **REFERENCE** parameter). The **OPOFFSET** parameter is ignored for this operation. This operation also includes a fold of the media outward along the finishing operation axis so that the front side of the first sheet in the collection is on the outside of the media collection. This operation is applied to collected media, not to individual media.

SADDLEIN Specifies that one or more staples are driven into the media along the axis of the finishing operation, which is positioned at the center of the media, parallel to the reference edge (see **REFERENCE** parameter). The **OPOFFSET** parameter is ignored for this operation. This operation also includes a fold of the media inward along the finishing operation axis so that the front side of the first sheet in the collection is on the outside of the media collection. This operation is applied to collected media, not to individual media.

UP3i

UP3i Parameters:

```
                            ┌─XOper──X'FFFF'──────┐
├──UP3i──XType──┬─n──────┬──┼─────────────────────┼──┤ More OPERATION parameters ├──────────────────┤
                └─X'hh'──┘  └─XOper──┬─n───────┬──┘
                                     └─X'hhhh'─┘
```

Specifies that these operations are passed to the printer using the Universal Printer Pre- and Post-Processing Interface (UP3i) finishing interface as specified in the "Form Finishing Operation Triplet" in the UP3i specification document. UP3i is an open standard intelligent interface intended for printers, pre-processors, post-processors, and other related applications.

The complete UP3i specification document, which includes the "Form Finishing Operation Triplet" can be viewed at the UP3i website home page:

http://www.up3i.org/

.

UP3i Explicit Operations
Specifies the explicit values for the "Finishing Operation Type" and the "Finishing Operation Parameter" that go in the UP3i Form Finishing Operation Triplet.

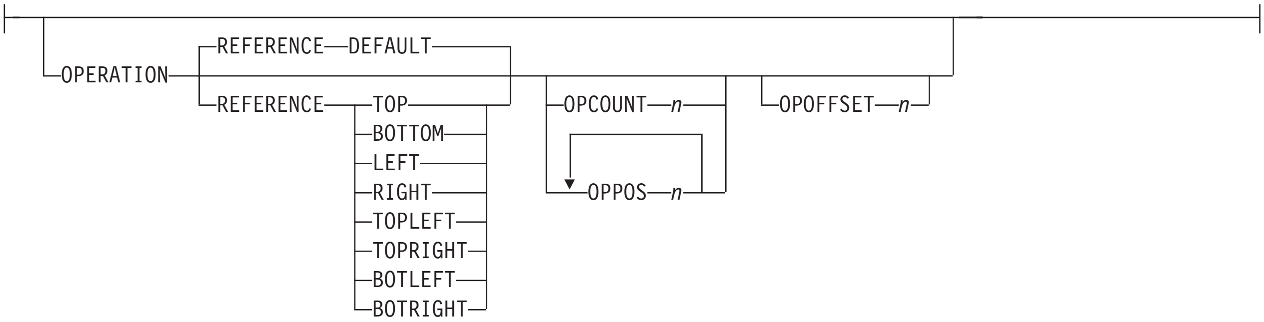
Note: See Table 9 on page 241 for values of **XType** and **XOper** as defined in the UP3i Specification Manual.

XType Explicit Operation Type. Specify in hexadecimal or a decimal equivalent number the Finishing Operation Type. A value of 0 specifies a No Operation/Pass through paper operation. When 0 is coded in this field, the **XOper** field is ignored. Enter 2 hexadecimal digits or a decimal number less than or equal to 255.

XOper Explicit Operation or Operation Parameter. Specify in hexadecimal or a decimal equivalent number the Finishing Operation Type. A value of X'FFFF' specifies the device default operation for the specified finishing operation for the specified Finishing Operation Type in the **XType** parameter. Enter 4 hexadecimal digits or a decimal number less than or equal to 65535.

OPERATION Parameters

More OPERATION Parameters:



REFERENCE Determines the reference corner or edge of the finishing operation.

DEFAULT Specifies that the device default determines the reference corner or edge.

TOPLEFT Specifies that, for the finishing operation, the reference corner is positioned at the top in the left corner. This **REFERENCE** parameter can be used only for **CORNER** operations.

TOPRIGHT Specifies that, for the finishing operation, the reference corner is positioned at the top in the right corner. This **REFERENCE** parameter can be used only for **CORNER** operations.

BOTRIGHT Specifies that, for the finishing operation, the reference corner is positioned at the bottom in the right corner. This

REFERENCE parameter can be used only for **CORNER** operations.

BOTLEFT Specifies that, for the finishing operation, the reference corner is positioned at the bottom in the left corner. This **REFERENCE** parameter can be used only for **CORNER** operations.

TOP Specifies that, for the finishing operation, the reference edge is positioned at the top.[6]

BOTTOM Specifies that, for the finishing operation, the reference edge is positioned at the bottom.[7]

LEFT Specifies that, for the finishing operation, the reference edge is positioned at the left.[7]

RIGHT Specifies that, for the finishing operation, the reference edge is positioned at the right.[7]

OPCOUNT *n* Use **OPCOUNT** to request a specific number of finishing operations; valid values are 1-122. Do not specify **OPPOS** values with **OPCOUNT**. If **OPPOS** is specified for corner staple, separation cut, perforation cut or fold, this **OPCOUNT** value is ignored. The

---

[6] This **REFERENCE** parameter can be used only for edge type operations (for example, **SADDLE**, **EDGE**, **FOLD**, **CFOLDIN**, **PUNCH**, **SADDLEIN**, **CUT**, **PERFORATE**).

[7] This **REFERENCE** parameter can be used only for edge type operations.

printer determines the positions of the operations. The default is **0** (zero).

OPPOS *n*

Use **OPPOS** to specify the offset of finishing operation along the finishing operation axis measured from the point where the finishing operation axis intersects the bottom edge or left edge of the medium toward the center of the medium. Each consecutive **OPPOS** parameter is used to position a single finishing operation centered on the specified point on the finishing operation.

For AFP the sub-parameter is an integer value in the range of 0-32,767, specified in millimeters.

For UP3i the sub-parameter is an integer value in the range of 0 to 999999999, specified in millipoints (1/72000 inch).

Do not specify the unit of measure. Do not specify **OPCOUNT** when you use **OPPOS**. If **OPPOS** is specified for corner staple, fold, separation cut, or perforation cut, the **OPCOUNT** value is ignored.

OPOFFSET *n*

Specifies the offset of finishing operation axis from the reference edge, measured from the reference edge toward the center of the medium.

For AFP the sub-parameter is an integer value in the range of 0-32,767, specified in millimeters.

For UP3i the sub-parameter is an integer value in the range of 0 to 999999999, specified in millipoints (1/72000 inch).

Do not specify **OPOFFSET** for corner staple or saddle stitch; the corner staple or saddle stitch values are ignored when specified with **OPOFFSET**.

The following examples show how to specify finishing operations.

To request scope as the entire print job with one corner staple in the top left corner, specify:

```
FINISH SCOPE PRINTFILE OPERATION CORNER REFERENCE
```

Sometimes a user wants to request multiple finishing operations. To request that the fifth document in the job stream be finished using top left corner staple and the ninth document be edge stitched only at the print default location, specify:

```
FINISH SCOPE 5
          OPERATION CORNER
          REFERENCE TOPLEFT
       SCOPE 9
          OPERATION EDGE;
```

The following example requests that **SCOPE 5** (the fifth document in the job stream):

1. Use the UP3i interface, be punched at the device default reference edge, and offset using the device default number and type of holes.
2. Use the normal AFP interface to staple the top-left corner.

and that **SCOPE 9** (the ninth document in the job stream):

1. Use the UP3i interface to be trimmed on the front.
2. Use the normal AFP interface to be edge stitched at the printer default location and offset using the device default number and type of staples.

```
FORMDEF FinSm2 Replace Yes
 FINISH
    SCOPE 5   OPERATION UP3i  XType X'0A'
              OPERATION        CORNER REFERENCE TOPL
    SCOPE 9   OPERATION UP3i   XType 6 XOper 1
              OPERATION AFP EDGE;
```

Finishing Operation Nesting Rules:

When more than one finishing operation involving a collection of media is specified for some portion of the print file, a nesting of the operations is defined first by the scope of the operation and second by the order of the operation in the data stream.

Finishing operations with a broader scope are nested outside of finishing operations with a narrower scope. The following scopes are listed in descending order:

1. Print-file level finishing (**SCOPE PRINTFILE**)
2. Document-level finishing, each document in the print file (**SCOPE ALL**)
3. Document-level finishing, a selected document in the **PRINTFILE** (**SCOPE** *n*)
4. Medium-map-level finishing, a collection of sheets (**SCOPE BEGCOLL**)

Finishing Operation Implementation Notes:

For some printers, the **JOG** function cannot be combined with a finishing operation. In this case, the **JOG** function is ignored. Check your printer documentation.

ADJUST *n*

```
├──┬────────────┬──────────────────────────────────────────────────────────────────┤
   └─ADJUST──n──┘
```

Establishes the range of horizontal adjustment for the printed area on the sheet. The default is **0**. The adjustment range can be set from 0 to 20 L-units. After a value is set, it is the maximum amount available in both directions, plus and minus.

Notes:

1. If you specify **ADJUST**, the maximum logical page size (in the horizontal direction) is reduced by the amount you specified here.
2. The **ADJUST** *n* subcommand is used only on the IBM 3800 printers.

INVOKE

```
   ┌─INVOKE──SHEET─────┐
├──┴─────────────────────┴──────────────────────────────────────────────────────────┤
   └─INVOKE──┬─NEXT──┬─┘
             ├─FRONT─┤
             └─BACK──┘
```

Specifies where the next page of data is placed when this copy group is activated by conditional processing or by an Invoke Medium Map structured field.

INVOKE SHEET, which is the default, places the next page of data on a new sheet. The **NEXT**, **FRONT**, and **BACK** parameters place the next page in a subsequent partition on the same sheet or, if no partitions are available, on the next sheet. If **FRONT** or **BACK** is specified, **INVOKE** selects only partitions on the front or back, respectively.

Print servers honor the **NEXT**, **FRONT**, and **BACK** values of the **INVOKE** subcommand only if the new copy group has the same medium modifications as the previous copy group. Some examples of medium modifications are duplexing, input bin, output bin, page offset, N_UP values, presentation, direction, medium (not page) overlays, text suppression, processing functions, print quality, finishing, jogging, and constant forms control. See the Media Eject Control Triplet (X'45') section in the *Mixed Object Document Content Architecture Reference*, SC31–6802 for a full description of the factors that allow a conditional eject to the next partition instead of the next sheet.

If any of these modifications differ, the print server ejects to a new sheet when the copy group is invoked. If you want to change overlays when ejecting to a new partition, use page overlays instead of medium overlays. See "Medium Overlays and Page Overlays" on page 169 for information about page and medium overlays.

When you use PLACE subcommands, the **NEXT**, **FRONT**, and **BACK** parameters place the next page using the next sequential **PLACE** subcommand that matches the requirement (next, front, or back). For example, if you print using the second **PLACE** subcommand of copy group A, and then you change to copy group B, you start with the third **PLACE** subcommand of copy group B.

A **CONSTANT** parameter on the **PLACE** subcommand does not alter the selection process. The selection is complete, even though the selected **PLACE** subcommand does not place the data. **N_UP** performs the constant modification and continues until it finds a **PLACE** subcommand that does not specify **CONSTANT**. The data is placed with this subcommand. Observe that this **PLACE** subcommand need not match the **FRONT** or **BACK** specifications of the **INVOKE** subcommand.

SHEET	Specifies that data be placed in the first selected partition of the sheet.[4]
NEXT	Specifies that data be placed in the next selected partition.
FRONT	Specifies that data be placed in the next selected front partition.
BACK	Specifies that data be placed in the next selected back partition.

JOG

```
├──┬──────────────┬──────────────────────────────────────────────────────┤
   └─JOG──┬─YES─┬─┘
          └─NO──┘
```

Specifies whether a **JOG** subcommand is sent to the printer when this **FORMDEF** is selected by an IMM structured field, or through conditional processing. When the **JOG** subcommand is sent, a printer either offsets (jogs) or prints copymarks. For cut-sheet printers, or for continuous-forms printers with burster-trimmer-stacker enabled, the **JOG** subcommand causes the first sheet controlled by this **FORMDEF** to be stacked offset from the previous sheets. For continuous forms printers without a burster-trimmer-stacker, the **JOG** subcommand causes an increment in the copymark printed on the carrier strip. **JOG** subcommands also are sent to the printer at the beginning of each data set or at the beginning of each job, depending on host parameters. For more information about copymarks, see the system programming guide for your host print server.

YES	Specifies that a **JOG** subcommand be sent to the printer. The first sheet printed is offset or the copymark is incremented.
NO	Specifies that no **JOG** subcommand be sent to the printer. The first sheet printed is not offset; the copymark is not incremented.

QUALITY *n*

```
├──┬─────────────┬───────────────────────────────────────────────────────┤
   └─QUALITY──n──┘
```

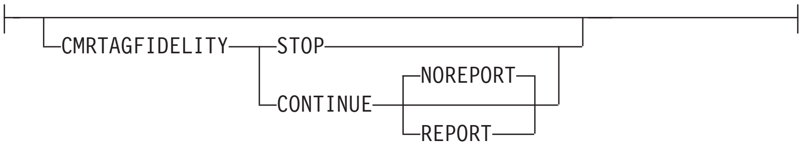
Specifies the print quality. This subcommand is recognized only on printers that can produce more than one level of print quality. The default is determined by the printer model. (On some printers, the default may be set at the printer itself.) For more information, refer to your printer publications.

n You can select a level of print quality by entering any whole number from 1 to 10. Higher numbers correspond to higher levels of print quality; lower numbers correspond to lower levels. For more information, refer to your printer publications.

Print quality is determined by a numerical code in the range of 1 to 254 (hexadecimal X'01'–X'FE'). The codes corresponding to the possible **QUALITY** parameters are:

1 = 15 (X'0F')
2 = 40 (X'28')
3 = 65 (X'41')
4 = 90 (X'5A')
5 = 115 (X'73')
6 = 140 (X'8C')
7 = 165 (X'A5')
8 = 190 (X'BE')
9 = 215 (X'D7')
10 = 240 (X'F0')

CMRTAGFIDELITY



Note: See Chapter 8, “AFP Color Management,” on page 173 for more information about using the CMRTAGFIDELITY subcommand.

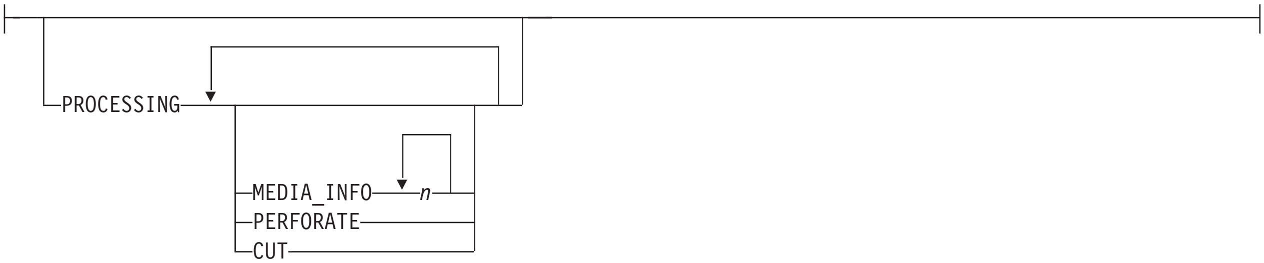
Specify the exception continuation and reporting rules for Color management resource (CMR) tag exceptions.

STOP CMR Tag exception rule is “Stop presentation at point of first CMR tag exception and report the exception”.

CONTINUE CMR Tag exception rule is “Do not stop presentation because of CMR tag exceptions and do one of the following:”

- **NOREPORT** Do not report the CMR tag exception to the print server. This is the default if neither **NOREPORT** or **REPORT** is coded.
- **REPORT** Report the CMR tag exception.

PROCESSING



Specifies additional post-processing capabilities for selected printers and attached equipment. This option can only be used on a single page or a set of pages. The subcommand expects one to three of the following keywords:

MEDIA_INFO *n*
This parameter specifies the ID of fixed medium information that a printer or printer–attached device applies to a page. Examples such as color plates logos, letter heads, and other fixed images.

The numeric values that can be included are:

0–254 These numeric values select a particular fixed medium local ID that the printer or printer–attached device applies to a sheet. One or more IDs can be specified within this range.

255 This value selects all the current fixed medium local IDs that the printer or printer–attached devices applies to a sheet.

PERFORATE Specifies a perforation cut at one or more fixed locations on the sheet according to the printer or printer–attached device.

CUT Specifies a separation cut at one or more fixed locations on the sheet according to the printer or printer–attached device.

COMMENT *qstring*

Specifies a string comment. Use **COMMENT** to mark a form definition with a user comment. The string is placed in the NOP structured field of the form definition.

qstring Specifies a quoted set of strings up to a total of 255 characters.

Note: In PPFA, a keyword or parameter (token) cannot extend across a line. Therefore, you must break the string into several strings in order to have a comment string that is longer than what fits on one line. Each string must be a complete token with beginning and ending quotes. For example:

```
FORMDEF replace yes
COMMENT 'first line of comment'
     'second line of comment';
```

PPFA composes the comment to be:

```
first line of comment second line of comment
```

and places it in a separate NOP structured field in the form definition.

COMPATPGP1

```
├──┬────────────┬──────────────────────────────────────────────────────┤
   └─COMPATPGP1─┘
```

Specifies that a Page Position structured field of type Format-1 (PGP-1) will be generated when a PGP of type Format-2 (PGP-2) is not required. A PGP-1 will be generated when all of the following conditions exist:

- The keyword **COMPATPGP1** is coded on the form definition
- The form definition is simplex
- The form definition is not enhanced **NUP** (with the **PLACE** subcommand)
- The form definition is not simple **NUP** (with the **PARTITION** subcommand.)

Note: If it does not matter which internal structures PPFA uses, you will not need to use this function.

PELSPERINCH *n*

```
├──┬────────────────┬──────────────────────────────────────────────────┤
   └─PELSPERINCH──n─┘
```

Specifies the Logical Units in pels per inch for this form definition. Use the **PELSPERINCH** parameter to tell PPFA the pel resolution of your printer to generate more exact object placements.

n Specifies an integer number between 1 and 3,276, which determines the Logical Units in pels per inch.

Note: If the L-Units are not specified on this form definition, they are defaulted to 240 pels per inch.

```
FORMDEF xmp01 replace yes
   PELSPERINCH 300 ;

  COPYGROUP C1
     offset 2 in  3 in;

  COPYGROUP C2
     offset 2 in  3 in
     PELSPERINCH  1200;
```

Figure 106. ***PELSPERINCH*** *example*

In Figure 106, the form definition xmp01 has specified L-Units as 300 pels per inch. Because the **COPYGROUP C1** does not specify L-Units, it inherits 300 pels per inch. **COPYGROUP C2** does specify L-Units as 1200 pels per inch.

The code in **COPYGROUP C1** (“offset 2 in 3 in”) produces internal and structured field values for *x* and *y* of 600 and 900, whereas in **COPYGROUP C2** the same code produces values of 2400 and 3600, because of the difference in L-Units.

BINERROR

```
├──┬──────────────────────────┬──────────────────────────────────────────────────────┤
   └─BINERROR──┬─STOP─────┬──┘
               └─CONTINUE─┘
```

Tells the printer whether or not you wish to stop printing if the wrong media is loaded on the printer or the bin number is not found.

This subcommand is displayed only on the **FORMDEF** command, not the **COPYGROUP** or the **SUBGROUP** commands since the scope of the subcommand is throughout the **FORMDEF**. Printing control is based on the status of the media loaded as it pertains to the **BIN** subcommand in effect at the time.

STOP If the specified input bin is in error, stop the print job and hold it in a state from which it can be resubmitted.

CONTINUE If the specified input bin is in error, continue printing using the printer default input bin.

COLORVALUERR

```
├──┬────────────────────────────────────────────┬─────────────────────────────────────┤
   ├─COLORVALUERR──STOP─────────────────────────┤
   │                            ┌─NOREPORT─┐    │
   └─COLORVALUERR──CONTINUE─────┼──────────┼────┘
                                └─REPORT───┘
```

When the form definition contains color values that the printer cannot render exactly as specified, you may request that the printer substitute colors and continue job processing, or you may request the printer to stop. If you request **STOP**, the printer issues an error and terminates. If you request **CONTINUE**, you may ask for an error report.

STOP Specifies that an error should be issued by the printer and the job terminated if the printer reports a color exception. A color exception is reported if the color specification in the data stream cannot be rendered as specified. Also, a color exception is reported if the host print server supports color fidelity and the target printer does not.

CONTINUE Specifies that an exception condition should be ignored. Also, the printer substitutes colors for any that it cannot render, and the job continues.

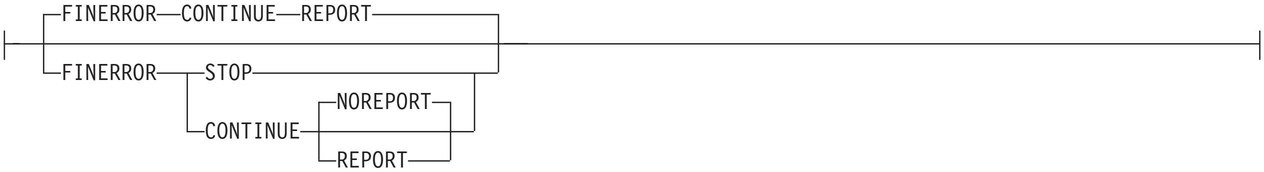
- **REPORT** Specifies that the error should be reported by the printer.

NOREPORT Specifies that the error should not be reported by the printer. **NOREPORT** is the default if **COLORVALUERR CONTINUE** is coded and neither **REPORT** nor **NOREPORT** is coded.

Note: When the printer reports a color value exception, the following actions are taken:

- If the print server and the printer both support Color Fidelity and the **COLORVALUERR** subcommand is coded, printing occurs as previously described.
- If the print server and the printer both support Color Fidelity and the **COLORVALUERR** subcommand is not coded, the print server instructs the printer to reset to defaults at the beginning of the job.
- Whenever the print server supports Color Fidelity, but the printer does not, the following rules apply:
  - If no **COLORVALUERR** subcommand is issued, printing continues. However, color exception errors are reported and ignored.
  - If the **COLORVALUERR** subcommand is issued, you could receive print server errors or the command could be ignored, depending on the level of PSF you have installed and your platform (for example, OS/390, VM, AIX, and so on). Therefore, you should not use the **COLORVALUERR** subcommand if you do not have a host print server that supports it.
- Whenever the printer supports Color Fidelity, but the print server does not, the following rules apply:
  - If no **COLORVALUERR** subcommand is issued, printing continues. However, color exception errors are reported and ignored.
  - If either **COLORVALUERR STOP** or **COLORVALUERR CONTINUE NOREPORT** are coded, the print server issues an error and stops printing, even if there is no color exception error.
  - If **COLORVALUERR CONTINUE REPORT** is coded, the print server continues printing. However, color exception errors are reported and ignored.

FINERROR



If both the host PSF and target printer support finishing fidelity, the **FINERROR** subcommand on the **FORMDEF** command lets you control job continuation and error reporting. If a form definition requests a finishing operation that is not available with the printer, you may request that the job continue processing or cause it to stop printing.

FINERROR only covers operations that the printer can not process. For example, a stapling operation has been specified on a device that is not equipped with a stapler. It does not cover temporary exceptions that require operator intervention, such as an empty stapler.

STOP Use **STOP** to specify the job be terminated when a finishing exception is detected by the printer. A finishing exception that stops presentation is reported and the print file is put on hold to be resubmitted when the finishing operation can be performed.

CONTINUE Use **CONTINUE** to specify that the exception condition should be ignored and the job continue without applying the unavailable finishing operation.

- **NOREPORT** Use **NOREPORT** to specify that the error not be reported by the printer. **NOREPORT** is the default if **FINERROR CONTINUE** is specified without specify **REPORT** or **NOREPORT**.
- **REPORT** Use **REPORT** to specify that the error be reported to the printer.

Notes:

1. If finishing fidelity is requested with the **FINERROR** subcommand and it is supported by the printer and the print server, the job is processed as specified with the **STOP**, **CONTINUE**, **REPORT**, and **NOREPORT** parameters.
2. If finishing fidelity is requested and supported by the print server, but is not supported by the printer, the request is processed by the print server as follows:
   - If you specify **FINERROR STOP**, the print server issues an error message and stops processing.
   - If you specify **FINERROR CONTINUE**, the print server prints the job and either issues a message if **REPORT** is specified or does not issue a message if **NOREPORT** is specified.
3. If finishing fidelity is not requested with the **FINERROR** subcommand or the print server does not support finishing fidelity, the job is printed and the finishing operations that can not be performed are not applied. Finishing exceptions are reported.

Examples:

```
FORMDEF xmp01 FINERROR STOP
              REPLACE YES;
  Copygroup X
    ... ;
FORMDEF xmp02 FINERROR Continue NoReport;
  Copygroup &
    ... ;
```

If both the print server and the printer support finishing fidelity:

- In the first example, `FORMDEF xmp01` specifies a **STOP** parameter if a finishing error is encountered. If the specified finishing operation is not available, the printer reports an error, does not print the job, and places the job on hold to be resubmitted when the finishing operation can be performed.
- In the second example, `FORMDEF xmp02` specifies a **CONTINUE** parameter if a finishing error is encountered and a **REPORT** is made. If a specified finishing operation is not available, the printer continues processing the print job without applying the unavailable finishing operation or reporting the error.

FONTFID

```
   ┌─FONTFID──NO──┐
├──┤              ├──────────────────────────────────────────────────────────┤
   └─FONTFID──YES─┘
```

Indicates to the print server whether the form definition honors the fidelity of the specified fonts when a raster font of a specified resolution and metric-technology cannot be found on the printer. In order to get the print server to honor this command you also must specify font resolution on either the **FONT** command or externally (for example, on the JCL). Not coding **FONTFID** is equivalent to coding **FONTFID NO**.

YES Specifies that no substitution is allowed and the print server issues an error message if it cannot find the font that matches the specified resolution and metric.

NO Specifies that the print server will not enforce font fidelity. The print server does not check for a match of the specified resolution and metric with the font found on the system.

Notes:

1. The **FONTFID** subcommand is designed to be used in concert with the **RESOLUTION** and **METRICTECHNOLOGY** subcommands on the **FONT** command, which are used to rigorously specify the font characteristics.
2. This subcommand assists the user who has created a form definition and page definition for printing with a raster font on a printer of one resolution (for example, a 240 pel printer), and has moved that application to a printer of another resolution (for example, a 300 pel printer). When the print server cannot match the raster font, it substitutes an outline font, which often causes the placed text to overflow or underflow the intended space on the page. If this happens, the user can specify the actual metric and resolution of the font being used to print the text and also specify **FONTFID YES**, so that the print server would not substitute another font.

TONERSAVER

```
   ┌─TONERSAVER──DEVSETTING─┐
├──┼────────────────────────┼──────────────────────────────────────────┤
   └─TONERSAVER──┬─OFF─┬────┘
                 └─ON──┘
```

Specifies whether or not the printer's toner saver mode should be activated. When activated, this may degrade print quality, and may also impact performance. If **DEVSETTING** is specified, the specific device's setting is used. If **TONERSAVER ON** or **OFF** is specified, it overrides any **QUALITY** parameters. This function is device specific. Make sure that your printers supports this feature by checking the printer's documentation.

N_UP { 1 | 2 | 3 | 4 }

```
├──┬──────────────────────────────────────────────┬────────────────────────┤
   └─N_UP──┬─1─┬──┬────────────────────────────┬──┘
           ├─2─┤  │ ┌─────────────────────────┐│
           ├─3─┤  │ ▼                         ││
           └─4─┘  ├──┤ OVERLAY Subcommand ├───┤│
                  │ ┌──────────────────────┐  │
                  │ ▼                      │  │
                  └──┤ PLACE Subcommand ├──┴──┘
```

Specifies the number (**1**, **2**, **3**, or **4**) of equal-size partitions into which the sheet is divided. See the list of printers that support the **N_UP** subcommand.
If you do not specify the **N_UP** subcommand in the **COPYGROUP** command, the **N_UP** subcommand from the FORMDEF command is the default for the **COPYGROUP** command. You can mix **N_UP** printing and non-**N_UP** printing by specifying or not specifying the **N_UP** subcommand in each copy group and by *not* specifying **N_UP** in the **FORMDEF** command.

OVERLAY *name*

OVERLAY Subcommand:

```
   ┌─────────────────────────────────────────────────────────────────────┐
   │                                              ┌─OVROTATE──0─────────┐ │
├──▼─OVERLAY──name──┬─────────────────┬──┬───────────┬──┼─────────────────────┼─┴──────┤
                    └─x-pos - y-pos───┘  └─PARTITION─┘  └─OVROTATE──┬─90──┬───┘
                                                                    ├─180─┤
                                                                    └─270─┘
```

Specifies the name of an overlay to be placed with every page in each of the **N_UP** partitions. The overlay is placed relative to the page origin, or if the **PARTITION** parameter is specified, relative to the partition origin. You can specify a maximum of 254 **OVERLAY** subcommands in a copy group.

rel-x rel-y	Specifies the horizontal and vertical adjustment to the position of the overlay. This is in addition to any offset values built into the overlay. The *x* and *y* values may be positive (+) and negative (–). You can specify them in inches (**IN**), millimeters (**MM**), centimeters (**CM**), points, or pels. If you do not specify a unit value, PPFA uses the unit value specified

in the last **SETUNITS** command or uses a default unit value of inches.

Note: This **OVERLAY** subcommand cannot be specified if the **PLACE** subcommand is specified. Use the **OVERLAY** parameter of the **PLACE** subcommand instead.

OVROTATE { 0 | 90 | 180 | 270 }
Specifies the rotation of the placed overlay with respect to the *x-axis* of the page.

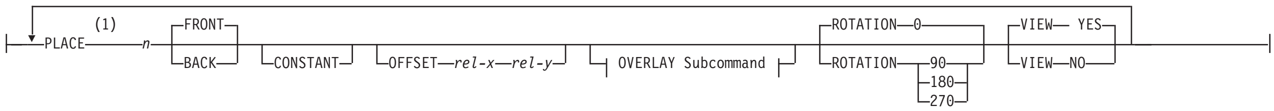
Example:

Assuming the overlay has (0,0) placement coordinates, this causes page overlay "x2" to be placed 1.5 inches to the right and 2.7 inches below the beginning of the page and rotated 90 degrees clockwise with respect to the page.

```
Formdef f1
    N_UP 1   PLACE 1 FRONT
             OVERLAY x2  1.5 in  2.7 in
             OVROTATE 90;
```

PLACE

PLACE Subcommand:



Notes:

1 The use of the **PLACE** subcommand indicates enhanced **N_UP** printing.

Places a page of data or a constant modification relative to a partition. Each **PLACE** subcommand specifies the number *n* of a partition on either the front or back side of the sheet. **FRONT** is the default, if you do not specify this subcommand. You must specify the same number of **PLACE** subcommands as the number of partitions on the sheet. The sequence of the **PLACE** subcommands is the sequence in which incoming pages are placed in the partitions.

Note: The **PLACE** subcommand is valid only on printers that support enhanced **N_UP** printing. If **PLACE** is not specified, pages are placed in partitions in the default partition sequence.

n Specifies the numbered partition (1–4) into which the page of data is placed.

FRONT
Specifies that this partition be placed on the front side of the sheet.

BACK Specifies that this partition be placed on the back side of the sheet.

CONSTANT

Specifies that no page data is placed by this **PLACE** subcommand.

Use **CONSTANT** when you are placing overlays without user's data or are placing fewer data pages on the sheet than the number of partitions specified in the **N_UP** subcommand.

For an example of using the **CONSTANT** parameter with overlays and to understand how the ordering of the **PLACE** subcommand affects overlays, see "Enhanced N_UP Example 3: Asymmetric Pages" on page 167.

OFFSET *rel-x rel-y*

Specifies a relative offset of the page horizontally (*x*) and vertically (*y*) from the partition origin. If **OFFSET** is not coded, PPFA uses the value of 0.1 inch for both the *x* and *y* offsets. This **OFFSET** parameter overrides any other **OFFSET** parameters specified on the **FORMDEF** or **COPYGROUP** command. You can specify the units in inches (in), millimeters (mm), centimeters (cm), points, or pels. If you do not specify a unit value, PPFA uses the unit value specified in the last **SETUNITS** command or uses a default unit value of inches.

Note: You may specify this offset as negative in order to crop the top and/or left of an image.

OVERLAY *name*

Specifies the name of an overlay to be placed with this **PLACE** subcommand. The overlay is placed relative to the page origin or, if the **PARTITION** keyword is specified, to the partition origin. You can specify multiple **OVERLAY** parameters in each **PLACE** subcommand.

rel-x rel-y

Specifies the horizontal and vertical adjustment to the position of the overlay. This is in addition to any offset values built into the overlay. The *x* and *y* values may be positive (+) and negative (−). You can specify them in inches (**IN**), millimeters (**MM**), centimeters (**CM**), points, or pels. If you do not specify a unit value, PPFA uses the unit value specified in the last **SETUNITS** command or uses a default value of inches.

PARTITION

Specifies that the previous offset is from the partition origin. If not present, the offset is from the page origin, which is subject to the **OFFSET** parameter.

OVROTATE { **0** | *90* | *180* | *270* }

Specifies the rotation of the placed overlay with respect to the *x-axis* of the page.

ROTATION {**0** | **90** | **180** | **270** }

Specifies the clockwise rotation of the page and associated page overlays placed by this **PLACE** command.

Rotation turns the page and its associated page overlays around their fixed origin points. If you rotate the page without moving its origin point, you might rotate it off the physical medium. To prevent this, always offset the page origin to the place you want it to be for the rotated page, as shown in Figure 107.

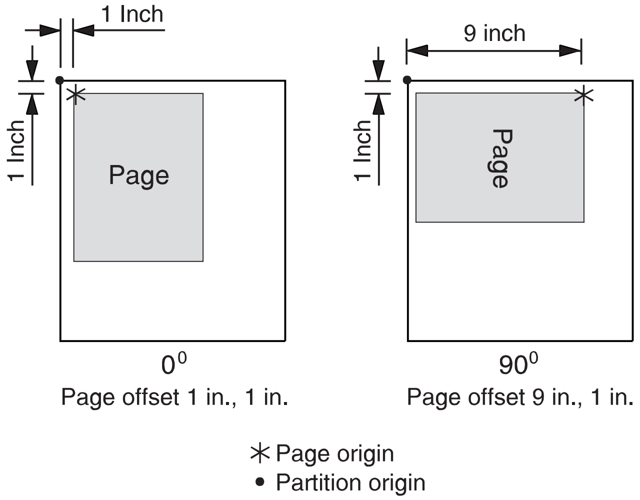


Figure 107. Offsetting the Page Origin for Rotated Pages

VIEW

Determines if this **N_UP PLACE** page is viewable. **VIEW** is relevant only when the page is being presented on a display. **VIEW** is ignored if the page is being printed. If **VIEW** is not coded, it is equivalent to specifying **VIEW YES**.

YES	Specifies that this **N_UP** page is viewable and is presented.
NO	Specifies that this **N_UP** page is not to be presented.

VFYSETUP *verificationID* **...**

Use to propagate the setup IDs to all medium maps (copygroups) in the form definition. Do not specify **VFYSETUP** on the **COPYGROUP** command. Before using the **VFYSETUP**

subcommand, verify that your version of print server supports **FORMDEF** setup verification.
To use **VFYSETUP**, specify one or more 2-character (4-digit hexadecimal) identifier sets that match the Setup Verification IDs defined at the printer operator's console for the specific print job. For example, if the Setup Verification IDs defined at the printer were X'012F', X'0521', and X'938A', specify the following:

```
FORMDEF vfy7 REPLACE YES VFYSETUP 012F 0521 938A;
```

When the print server processes the print job, it compares the setup verification IDs in the form definition to the IDS that are active in the printer. If the active IDs in the printer do not match the IDs required by the form definition, or if the printer does not support **FORMDEF** setup verification IDs, the job is held.

VFYSETUPD *decimal/verificationID* **...**

```
├──┬─────────────────────────────────────────────┬──────────────────────────────────────────┤
   │                ┌──────────────────────────┐ │
   └─VFYSETUPD──────▼─decimal──verificationIDs─┴─┘
```

Use to propagate the setup IDs to all medium maps (copygroups) in the form definition. Do not specify **VFYSETUPD** on the **COPYGROUP** command. Before using the **VFYSETUPD** subcommand, verify that your version of print server supports **FORMDEF** setup verification.
To use **VFYSETUPD**, specify one or more decimal numbers that match the Setup Verification IDs defined at the printer operator's console for the specific print job. For example, if the Setup Verification IDs defined at the printer were 303, 1313, and 37770, specify the following:

```
FORMDEF vfy7 REPLACE YES VFYSETUPD 303 1313 37770;
```

When the print server processes the print job, it compares the setup verification IDs in the form definition to the IDS that are active in the printer. If the active IDs in the printer do not match the IDs required by the form definition, or if the printer does not support **FORMDEF** setup verification IDs, the job is held.

TEXTERROR

```
├──┬───────────────────────────────────────────┬───────────────────────────────────────────┤
   └─TEXTERROR──┬─STOP───────────────────────┤
                │          ┌─NOREPORT─┐      │
                └─CONTINUE─┤          ├──────┘
                           └─REPORT───┘
```

Text Fidelity subcommand. This subcommand allows you to specify what happens when the printer reports a text exception. A text exception is reported if the printer encounters a text control sequence it doesn't recognize.

Note: If the printer and print server both support Text Fidelity, the following occurs.

STOP
When a text exception occurs, this parameter specifies that the job be terminated and the text exception be reported.

Note: When presentation is terminated, the print file is put into a state where it can be resubmitted when the text can be rendered without exceptions.

CONTINUE When a text exception occurs, this parameter instructs the printer to skip the text control sequence it did not recognize and continue processing the print job.

REPORT Specifies that the error should be reported by the printer.

NOREPORT Specifies that the error should ***not*** be reported by the printer. This is the default if **TEXTERROR CONTINUE** is coded.

form-size

Form-size Parameters:

```
├──┬─────────────────────┬──┬─────────────────────┬──────────────────────────────────────────┤
   └─XMSIZE──x──┬───────┬┘  └─YMSIZE──y──┬───────┬┘
                └─units─┘                └─units─┘
```

Specifies the medium presentation space. This is also known as the medium size or form length and form width.

Notes:

1. This function requires both Printer Server and Printer support.
2. The printer will not adjust your media presentation space size to be larger than the paper size (or what the printer thinks is the paper size).
3. Some printers (such as the InfoPrint 1145 and the InfoPrint 4100) do not support the IPDS “Set Media Size” (SMS) command. The form size cannot be set with the form definition. **Do not use the XMSIZE and YMSIZE subcommands for those printers which do not support the SMS commands**.
4. Other printers (such as the 6400, 4247, and 4230) do not support the “Set Media Origin” (SMO) command. The media origin does not change. **For the 6500, 6400, 4247, and 4230 printers form length is always YMSIZE and form width is always XMSIZE**.
5. For all other printers, use the settings shown in Table 10 on page 255. For these other printers, whether the **XMSIZE** or **YMSIZE** is actually form length or form width depends on the medium presentation space orientation, type of form, and NUP setting. The following examples are from Table 10 on page 255. See the table for other media combinations.
   - Wide fanfold paper, **PRESENT**=Landscape, **DIRECTION**=**ACROSS**, and no-**NUP** - The form length is **YMSIZE**.
   - Narrow fanfold paper, **PRESENT**=Landscape, **DIRECTION**=**ACROSS**, and no-**NUP** - The form length is **XMSIZE**.

- Cutsheet paper, **PRESENT**=Landscape, **DIRECTION**=**ACROSS**, and no-**NUP** - The form length is **XMSIZE**.

6. **There are only two choices. If you try one that doesn't work, try the other.** For example, if you try **XMSIZE** for the form length and it doesn't create a longer form, use **YMSIZE**.

XMSIZE
This specifies the medium presentation space along the X-axis (also known as the medium's size in the X-direction). If this subcommand is specified on the **FORMDEF** command, it becomes the default for all copygroups which do not specify **XMSIZE** on the **COPYGROUP** command. If this subcommand is not specified on the **FORMDEF** command, the printer's current default X-axis becomes the default for all copygroups which do not specify **XMSIZE** on the **COPYGROUP** command.

x Enter a number with 0 to 3 decimal places and optional units.

YMSIZE
This specifies the medium presentation space along the Y-axis (also known as the medium's size in the Y-direction). If this subcommand is specified on the **FORMDEF** command, it becomes the default for all copygroups which do not specify **YMSIZE** on the **COPYGROUP** command. If this subcommand is not specified on the **FORMDEF** command, the printer's current default Y-axis becomes the default for all copygroups which do not specify **YMSIZE** on the **COPYGROUP** command.

y Enter a number with 0 to 3 decimal places and optional units.

units
Enter **IN** for inches, **CM** for centimeters, **MM** for millimeters, or **PELS** for pels. If *units* is not specified, the default is to the latest setting of the **SETUNITS** command, or inches if no **SETUNITS** command is coded.

Code Examples

```
FORMDEF FMSZX1   Replace Yes
    PRESENT Landscape Direction Across
    XMSIZE 8.5 in YMSIZE 11.0 in;
 COPYGROUP cp1;
 COPYGROUP cp2;

FORMDEF FMSZX2   Replace Yes YMSIZE 17.0 in;
 COPYGROUP cp3;
 COPYGROUP cp4;
```

In the previous example:
- The printer is a 4400 thermal printer which supports both SMS and SMO IPDS commands. The form definition named FMSZX1 defines a form length of 8.5 inches and form width of 11.0 inches. Copygroups “cp1” and “cp2” inherit those sizes from the form definition.
- The printer is a 6400 printer and you want to define the form length. The form definition named FMSZX2 defines

form length as 17 inches and leaves the form width as the printer default. Copygroups “cp3” and “cp4” inherit those sizes from the form definition.
- If this is run on an MVS platform which has FORMLEN defined in the JCL, the JCL definition is used.

OVERLAY Command

OVERLAY Command

```
                                  ┌─NORASTER─┐
►►─OVERLAY─┬───────┬─name2─┼──────────┼─;─────────────────────────────►◄
           └─name1─┘              └─RASTER───┘
```

This **OVERLAY** command identifies an electronic *medium overlay* to be used in one or more subgroups of a copy group, see “Medium Overlays and Page Overlays” on page 169 for additional information. When using the **OVERLAY** command, follow these guidelines:

- An **OVERLAY** command comes after the **COPYGROUP** command.
- A separate **OVERLAY** command must be specified for each electronic overlay used in a subgroup.
- A maximum of 254 **OVERLAY** commands can be specified for coded overlays per copy group.
- The overlay named here must be referenced in a **SUBGROUP** command in order to be printed (see page 299).

Notes:

1. Overlays contain their own positioning controls.
2. This does not define *page overlays,* that are placed using the **N_UP** subcommand. See “Medium Overlays and Page Overlays” on page 169 for additional information.

OVERLAY [*name1* **]** *name2*

Identifies an electronic overlay to be used in one or more subgroups of a copy group.

name1 Specifies an alphanumeric name of 1 to 16 characters (local name) for the overlay. It must conform to the token rules and must be unique within a copy group.

Note: If *name1* is omitted, *name2* is used as the local name and is the name used in the subgroup command.

name2 Specifies an alphanumeric name of 1 to 6 characters (user-access name) for this overlay. A prefix of *O1* is added by PPFA to identify the overlay resource.

Subcommand

RASTER or NORASTER[8]

Specifies overlays as raster or not raster data.

RASTER Specifies this overlay is to be kept in the printer as raster data. If this overlay is to be used several times, the printer does not need to recompile it each time.

Note: This function is ignored by PSF for AIX. One raster overlay can be specified per copy group.

---

[8] The **RASTER** or **NORASTER** subcommands are used only on the IBM 3800 printers.

NORASTER Specifies this is a coded overlay. A maximum of 254 coded overlays can be specified per copy group.

SETUNITS Command

SETUNITS Command

```
►►──SETUNITS──┬─ 1 ──IN── 1 ──IN─────────────────┬──┬──────────────────────────────┬──;──────►◄
              └─x─────────────────y──────────────┘  └─LINESP──n──┬─IN─────┬──────┘
                  ├─IN──────┤         ├─IN──────┤                  ├─MM─────┤
                  ├─MM──────┤         ├─MM──────┤                  ├─CM─────┤
                  ├─CM──────┤         ├─CM──────┤                  ├─POINTS─┤
                  ├─POINTS──┤         ├─POINTS──┤                  ├─PELS───┤
                  ├─PELS────┤         ├─PELS────┤                  └─LPI────┘
                  └─CPI─────┘         └─LPI─────┘
```

The **SETUNITS** command specifies the value and the unit of measurement that is the default for any subsequent measurement parameter in all of the commands and subcommands. These values remain the default values until another **SETUNITS** command is specified. The **SETUNITS** command should be specified as the first command in a form definition. If neither this command nor a measurement parameter is specified, the defaults identified within the following description are used.

SETUNITS Specifies the value and the unit of measurement that is the default for any subsequent measurement parameter in all of the commands and subcommands.

x-pos Specifies the number used for horizontal measurement. A number with up to three decimal places may be used. The default is **1**. The unit choices are **IN**, **MM**, **CM**, **POINTS**, **PELS**, or **CPI**.

Note: This value affects subsequent **OFFSET** subcommands.

y-pos Specifies the number used for vertical measurement. A number with up to three decimal places may be used. The default is **1**. The unit choices are **IN**, **MM**, **CM**, **POINTS**, **PELS**, or **LPI**.

Note: This value affects subsequent **OFFSET** subcommands.

Using CPI and LPI Units of Measurement

The **CPI** and **LPI** units of measurement make it possible to write the following command:

```
SETUNITS 10 CPI 6 LPI ;
```

This command sets the units of measurement for horizontal and vertical spacing in terms of characters per inch and lines per inch. You can then use the **OFFSET** subcommand specifications to increment the spacing one character or one line at a time. The distance specified by *n* characters over and by *n* lines down is defined in the governing **SETUNITS** command. In this example, there are 10 characters per inch (**CPI**) and 6 lines per inch (**LPI**).

Subcommand

LINESP *n*

This subcommand is to be used within a page definition to set up default line spacing; it serves no purpose when used within a form definition.

SUBGROUP Command

SUBGROUP Command

```
                             ┌─FLASH──NO──┐ ┌─BOTH──┐
►►──SUBGROUP──┬────────────┬─┼────────────┼─┼───────┼──────────────────────►
              └─COPIES──n──┘ └─FLASH──YES─┘ ├─BACK──┤
                                            └─FRONT─┘

   ┌─BIN──1──────────────────────────────────────────────────────┐
►──┼─────────────────────────────────────────────────────────────┼────────►
   └─BIN──┬─n────────┬──┬───────────────────┬──┬────────────┬────┘
          ├─MANUAL───┤  └─MEDIANAME──qstring─┘  └─COMPID──m─┘
          └─ENVELOPE─┘

►──┬───────────┬──┬────────────────────┬──┬────────────────────────┬──;──►◄
   └─OUTBIN──n─┘  │          ┌───────┐ │  │              ┌───────┐ │
                  └─OVERLAY──▼─name──┴─┘  └─SUPPRESSION──▼─name──┴─┘
```

The **SUBGROUP** command specifies the number of copies of a single page that are to be printed and any modifications (consisting of overlays, suppressions, type of duplexing, and forms flash) to be made to the copies. A **SUBGROUP** command follows a **COPYGROUP** command; a maximum of 127 **SUBGROUP** commands can be specified within each copy group.

Notes:

1. The **BOTH** subcommand causes two subgroups to be generated. Thus, a maximum of 63 subgroups can be specified when the **BOTH** subcommand is used.
2. When you specify the **DUPLEX** subcommand (with a parameter other than NO) in the **COPYGROUP** command, you must include one **SUBGROUP** command for each side of a sheet, or you may specify the **BOTH** subcommand in a single **SUBGROUP** command.

Subcommands

COPIES *n*

```
├──┬────────────┬──────────────────────────────────────────────────────────┤
   └─COPIES──n──┘
```

Specifies how many copies of each page are to be printed.

n Defines the number of copies (the maximum number is 255). When **BACK** is specified within a **SUBGROUP** command, the system counts the front pages printed (the actual number of sheets) not copies made (front and back). The default is **1**.

FLASH[9]

```
   ┌─FLASH──NO──┐
├──┼────────────┼──────────────────────────────────────────────────────────┤
   └─FLASH──YES─┘
```

Specifies whether to use forms flash.

Note: When forms flash is used, its name must be specified in the job control language for the print job. The operator must place the correct negative into the 3800 when the job is ready to print.

NO Specifies that forms flash does not occur.

YES Specifies that forms flash occurs.

{ BACK or FRONT or BOTH }

```
  ┌─BOTH──┐
├─┼───────┼──────────────────────────────────────────────────────────────┤
  ├─BACK──┤
  └─FRONT─┘
```

These optional subcommands specify whether the subgroup is for both sides of a sheet or for only the front or the back side.

Rules::

1. Subgroups must specify **FRONT** and **BACK** if an overlay, suppression, or forms flash appears on one side but not on the other.
2. The **FRONT** and **BACK** subgroups must have the same number of copies.

   If the number of copies differs, the **COPIES** parameter of the **BACK** subgroup is ignored, and a warning message is issued.
3. The **FRONT** and **BACK** subcommands must occur in pairs.
4. If the **FRONT** and **BACK** subcommands are specified with **DUPLEX NO** (in the **FORMDEF** or **COPYGROUP** commands), PPFA issues an error message and does not create the form definition.

BACK Specifies this **SUBGROUP** command is for the back sides of the sheets.

A subgroup with a **BACK** subcommand must have a **FRONT** subcommand in the preceding subgroup.

FRONT Specifies this subgroup is for the front sides of the sheets.

If a **DUPLEX** subcommand in a **FORMDEF** or **COPYGROUP** command is specified with a parameter other than NO and the **FRONT** subcommand is specified in a **SUBGROUP** command, the next **SUBGROUP** command must have a **BACK** subcommand.

BOTH Specifies this subgroup is used for both sides of the sheet.

This is the default when **DUPLEX** is specified in the copy group.

---

[9] The **FLASH** subcommand is used only on the IBM 3800 printers.

If **BOTH** is specified with **DUPLEX NO** (in a **FORMDEF** or **COPYGROUP** command), PPFA issues a warning message and ignores the **BOTH** subcommand.

BIN

```
   ┌─BIN──1──────────────────────────────────────────────────────────┐
├──┼─────────────────────────────────────────────────────────────────┼──────────────────────────────┤
   └─BIN──────┬──────────┬────┬─────────────────────┬───┬───────────┬┘
              ├─n────────┤    └─MEDIANAME──qstring──┘   └─COMPID──m─┘
              ├─MANUAL───┤
              └─ENVELOPE─┘
```

Specifies the paper source. This subcommand should be used only for printers that have more than one paper source.

Note: If you specify the **BIN** subcommand, you must also specify at least one of the legal parameters.

n	An integer number between 1 and 255 that is the Media Source Id (also known as the bin number).
1	Selects the primary paper source.
2–255	Selects another paper source. If the specified bin does not exist on your printer, the default paper source for that printer is used. For more information about paper sources on your printer, refer to your printer publications. Using a value of *100* is the same as specifying **MANUAL**.

MANUAL

Selects manual feed as a paper source on those printers that support manual feed. For more information, refer to your printer publications.

ENVELOPE

Selects an envelope paper source on those printers that support this function. For more information, refer to your printer documentation.

Notes:

1. **BIN** selection is overridden by the printer if the form defined to each bin is the same form number. Only the primary bin is selected.
2. The primary source usually contains either letter-size (U.S.) or A4 (I.S.O.) paper. Other paper sources are used for less common paper sizes (such as legal-size) and for special paper (such as colored stock or pre-printed letterhead on heavy bond).
3. If duplexing is requested and you select from the front side from one bind and the back side from another bin, a warning message is issued and the printer takes the paper from the bin specified on the front side.

MEDIANAME

Selects a media source by specifying an agreed upon name for the bin. For a current list of the valid media names, see Appendix G, “PPFA Media Names,” on page 611.

qstring Up to 12 characters within single quotes specifying the media source name. On some printers, this name is pre-set into the printer; on others, it also can be entered into the printer by the user. Refer to your printer documentation for further information.

COMPID *m*
Selects a bin based on the component id.

Note: For a current list of component ids, see Appendix G, "PPFA Media Names," on page 611. Component ids from 12,288 to 268,435,455 are reserved for the user.

OUTBIN *n*

```
├──┬─────────────┬──────────────────────────────────────────────┤
   └─OUTBIN──n───┘
```

Specifies the destination bin number for any pages directed by this form definition. Copygroups and subgroups in this form definition that do not specify an output bin number inherit this bin number.

OVERLAY

```
├──┬─────────────────────────┬──────────────────────────────────┤
   │            ┌──────────┐ │
   │            ▼          │ │
   └─OVERLAY──────name─────┴─┘
```

Specifies the electronic overlay that is to be used with this subgroup.

name Specifies either the local or user-access name. A maximum of eight names can be specified within a subgroup.

Notes:

1. If the local name is used, it must be defined in an **OVERLAY** command before it can be referenced.
2. PPFA does not check for duplicate user-access names.

SUPPRESSION

```
├──┬─────────────────────────────┬──────────────────────────────┤
   │                ┌──────────┐ │
   │                ▼          │ │
   └─SUPPRESSION──────name─────┴─┘
```

Specifies that the named field is suppressed.

name Specifies a alphanumeric name of 1 to 8 characters (local name) of the text field to be suppressed. A maximum of eight names can be specified within a subgroup.

The suppression field named here must be defined in a **SUPPRESSION** command following the **FORMDEF** command before it can be referenced. See page "SUPPRESSION Command" on page 300.

Note: This is for text only fields.

SUPPRESSION Command

SUPPRESSION Command

```
►►──SUPPRESSION──name──;──────────────────────────────────────────────►◄
```

A **SUPPRESSION** command, if used, must immediately follow the **FORMDEF** command. It names the suppression that is specified in the **FIELD** command of a page definition associating the form definition and the page definition.

SUPPRESSION *name*

Identifies an alphanumeric name of 1 to 8 characters (local name). The name must conform to the token rules.

You must specify the area to be suppressed in a **FIELD** command or a **SUBGROUP** command using one of the names specified within this series of **SUPPRESSION** commands for the suppression to be effective.

Notes:

1. The **SUPPRESSION** command is for text only fields. It does not work for barcodes or other non-text fields.
2. A maximum of eight suppressions can be specified for one **SUBGROUP** command, and a maximum of 127 suppressions can be specified within one form definition.

Chapter 11. Page Definition Command Reference

This section includes:
- Sequence of commands for page definitions
- Page definition commands listed alphabetically
- Detailed information on each command
- Descriptions of the applicable subcommands and parameters for each command

Sequence of Traditional Commands for Page Definitions with PRINTLINE

```
[ SETUNITS ... ]
PAGEDEF
[ DEFINE CMRNAME ...]
[ FONT ...]
[ DOFONT ... ]
[ OBJECT ... ]
[DEFINE COLOR ... ]
[ PAGEFORMAT ]
  [ TRCREF ...]
  [ SEGMENT ...]
  [ RENDER ...]
  [ OVERLAY ...]
  [ EXTREF ... ]
  [ CMR ...]
  PRINTLINE [  FIELD | CONDITION ...]
  [ ENDSUBPAGE ] |
  [ PRINTLINE [ FIELD | CONDITION ...] ...]
[ PAGEFORMAT ]
  [ TRCREF ...]
  [ SEGMENT ...]
  [ OVERLAY ...]
  PRINTLINE [ FIELD | CONDITION  ...]
  [ ENDSUBPAGE ] |
  [ PRINTLINE [ FIELD | CONDITION ...] ...]
```

- **FONT** and **DOFONT** commands must be specified immediately after a **PAGEDEF** command. The exception is the **SETUNITS** command.
- **OBJECT** commands must be specified immediately after any **FONT** commands and before any **PAGEFORMAT** or other commands, except the **SETUNITS** command.
- A **SETUNITS** command can be placed before any other PPFA command. The values set are in effect until the next **SETUNITS** command.
- **TRCREF**, **SEGMENT**, and **OVERLAY** commands must be specified under their associated **PAGEFORMAT** command.
- The first **PAGEFORMAT** command can be omitted in a page definition, if the page definition contains only one page format. If the **PAGEFORMAT** command is omitted, the **PAGEDEF** command parameters are used to define the page format.
- At least one **PRINTLINE** command is required per page format for Traditional Line Data Page definition. **PRINTLINE** and **LAYOUT** commands cannot be used within the same page definition.
- An **ENDSUBPAGE** command can occur anywhere in a page definition that a **PRINTLINE** command can occur, except it can not occur between a **PRINTLINE** command and its associated **FIELD** and **CONDITION** commands.

- One file can contain multiple sets of page definitions.

Sequence of Record Formatting Commands for Page Definitions with LAYOUT

```
[ SETUNITS ...]
PAGEDEF
FONT
[ DOFONT ... ]
[OBJECT ... ]
[DEFINE COLOR... ]
[ PAGEFORMAT ]
  [ SEGMENT ...]
  [ OVERLAY ...]
  [ RENDER ...]
  [ EXTREF ... ]
  [ CMR ...]
  [ LAYOUT ...]
   [ CONDITION ...]
   [ FIELD ...]
   [ DRAWGRAPHIC ...]
   [ ENDGRAPHIC ...]
[ PAGEFORMAT ]
  [ SEGMENT ...]
  [ OVERLAY ...]
  [ LAYOUT ...]
   [ CONDITION ...]
   [ FIELD ...]
   [ DRAWGRAPHIC ...]
   [ ENDGRAPHIC ...]
```

- **LAYOUT**, **XLAYOUT**, and **PRINTLINE** commands cannot be mixed within the same **PAGEDEF**. At least one **LAYOUT** command is required per page format for a record formatting page definition.
- **FONT** and **DOFONT** commands must be specified immediately after a **PAGEDEF** command.
- A **SETUNITS** command can be placed before any other PPFA command. The values set are in effect until the next **SETUNITS** command.
- **SEGMENT**, **OVERLAY** and **EXTREF** commands must be specified under their associated **PAGEFORMAT** command.
- The first **PAGEFORMAT** command can be omitted in a page definition, if the page definition contains only one page format. If the **PAGEFORMAT** command is omitted, the **PAGEDEF** command parameters are used to define the page format.
- One file can contain multiple sets of page definitions.
- At least one **FONT** or **DOFONT** command is required for each **PAGEDEF** command.

Sequence of Commands for XML Page Definitions with XLAYOUT

```
[ SETUNITS ...]
PAGEDEF
FONT
[ DOFONT ... ]
[OBJECT ... ]
[DEFINE COLOR... ]
[DEFINE QTAG ...]
[ PAGEFORMAT ]
  [ SEGMENT ...]
  [ OVERLAY ...]
  [ RENDER ...]
  [ EXTREF ... ]
  [ CMR ...]
  [ XLAYOUT ...]
   [ CONDITION ...]
   [ FIELD ...]
   [ DRAWGRAPHIC ...]
   [ ENDGRAPHIC ...]
[ PAGEFORMAT ]
  [ SEGMENT ...]
  [ OVERLAY ...]
  [ XLAYOUT ...]
   [ CONDITION ...]
   [ FIELD ...]
   [ DRAWGRAPHIC ...]
   [ ENDGRAPHIC ...]
```

- **LAYOUT**, **XLAYOUT**, and **PRINTLINE** commands cannot be mixed within the same **PAGEDEF**. At least one **XLAYOUT** command is required per page format for an XML page definition. At least one **FONT** or **DOFONT** command is required for each **PAGEDEF** command.
- **FONT** and **DOFONT** commands must be specified immediately after a **PAGEDEF** command.
- A **SETUNITS** command can be placed before any other PPFA command. The values set are in effect until the next **SETUNITS** command.
- **SEGMENT**, **OVERLAY** and **EXTREF** commands must be specified under their associated **PAGEFORMAT** command.
- The first **PAGEFORMAT** command can be omitted in a page definition, if the page definition contains only one page format. If the **PAGEFORMAT** command is omitted, the **PAGEDEF** command parameters are used to define the page format.
- One file can contain multiple sets of page definitions.
- **DOFONT** commands must be after the **PAGEDEF** command and before the first **PAGEFORMAT** command.
- **EXTREF** must be after a **PAGEFORMAT** (the scope if for that pageformat) and before the first **PRINTLINE / LAYOUT** or **/XLAYOUT**.

Diagram Shorthand

These terms are used in the command definitions:

x-pos	A vertical position using a numeric number followed optionally by a unit. For the available units, see "Units of Measurement" on page 220.
y-pos	A horizontal position using a numeric number followed optionally by a unit. For the available units, see "Units of Measurement" on page 220.

CONDITION Command

CONDITION Command

```
►►──CONDITION──condname──┤ START (Traditional) ├──┤ START (Record Format and XML) ├──────────────►
```

```
    ┌──────────────────────────────────────────────────────────────────────────────────────┐
    ▼                          ┌─BEFORE─┐  ┌─SUBPAGE─┐  ┌─NEWFORM──────────────────────────────────┐  │
►───WHEN───┬─CHANGE──────────┬─┴─AFTER──┴──┴─LINE────┴──┼─NEWSIDE──────────────────────────────────┤  ├──────►
           └─┬─EQ─┬──'text'──┘                          └─┬─CURRENT or = ────┬──┬─CURRENT or = ────┬─┘
             ├─NE─┤                                       ├─FIRST────────────┤  ├─FIRST────────────┤
             ├─GT─┤                                       ├─NULL or /────────┤  ├─NULL or /────────┤
             ├─GE─┤                                       ├─NEXT─────────────┤  ├─NEXT─────────────┤
             ├─LT─┤                                       └─COPYGROUP cgname─┘  └─PAGEFORMAT pfname─┘
             └─LE─┘
```

```
►──┬───────────────────────────────────────────────────────────────────────────────────────────┬──;──────►◄
   │             ┌─BEFORE─┐  ┌─SUBPAGE─┐  ┌─NEWFORM──────────────────────────────────────────┐  │
   └─OTHERWISE───┴─AFTER──┴──┴─LINE────┴──┼─NEWSIDE──────────────────────────────────────────┼──┘
                                          └─┬─CURRENT or = ────┬──┬─CURRENT or = ─────┬──────┘
                                            ├─FIRST────────────┤  ├─FIRST─────────────┤
                                            ├─NULL or /────────┤  ├─NULL or /─────────┤
                                            ├─NEXT─────────────┤  ├─NEXT──────────────┤
                                            └─COPYGROUP cgname─┘  └─PAGEFORMAT pfname─┘
```

START (Traditional):

```
                           ┌─SPACE_THEN_PRINT──YES─┐
├──START──n──LENGTH──n─────┴─SPACE_THEN_PRINT──NO──┴──────────────────────────────┤
```

START (Record Format and XML):

```
├──┬─START──n──LENGTH──n──────────────────────────────────────────┬─────────────────┤
   │              ┌─START - 1─┐   ┌─LENGTH──longest─┐             │
   └─FLDNUM──n────┴─START──n──┴───┴─LENGTH──n───────┴─────────────┘
```

Short Form

```
►►──CONDITION──condname──┬────────────┬──;──────────────────────────────►◄
                         └─START──n───┘
```

CONDITION The **CONDITION** command examines data in an input record and specifies actions to be taken based on the result of the examination.

- The *condname* parameter must come before any subcommands
- No **WHEN** subcommand can follow an **OTHERWISE** subcommand in the same **CONDITION** command

condname Names the condition. The name must contain 1 to 8 alphanumeric characters.

PPFA allows cross-referencing to the *condname*. The cross-reference is done by using the short form of the **CONDITION** command (second format in the syntax table). By specifying a previously defined *condname*, PPFA uses the specifications from that command. When the condition is reused, the point where you want the comparison to begin may be at a different point in the record. By specifying the optional **START** subcommand, you can change the starting point of the comparison but not the field length. If the **START** subcommand is not specified, the starting point is the same as defined in the original **CONDITION** command.

Note: When comparing text in fields that contain delimiters, the comparison text must not contain the delimiter. The delimiter is not part of the data.

Subcommands (Long Form)

START *n*

```
├──START──n──────────────────────────────────────────────────────────────┤
```

Specifies the starting byte of the comparison field within the data record where the comparison is to be done.

n Specifies the number of bytes from the first data byte in the record as the starting point of the comparison field. The first data byte position of an input record is 1.

Note: The carriage-control character and the table-reference character are not considered data.

LENGTH *n*

```
├──LENGTH──n─────────────────────────────────────────────────────────────┤
```

Specifies the length of the comparison field.

n Specifies the number of bytes in the data record to be compared, beginning with the position specified in **START**. Valid values are numbers from 1 to 8000. The length of the constant text must be the same as defined in this parameter or the results are invalid.

Comparisons are done on a byte-by-byte basis. Because the comparison field and the constant text must have the same lengths, padding is not necessary.

Note: If any part of the comparison field specified by the combination of **START** and **LENGTH** is outside the boundaries of the data record, all conditional processing is not performed. No **WHEN** is executed. If an **OTHERWISE** is present, it is not executed either.

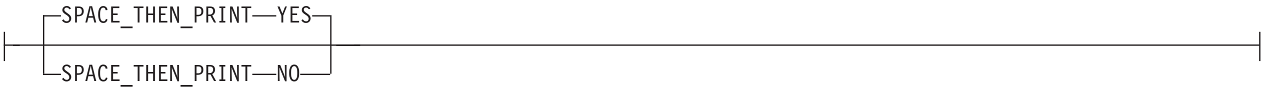
FLDNUM (Record Format and XML only)

```
              ┌─START 1──┐  ┌─LENGTH──longest─┐
├──FLDNUM──n──┼──────────┼──┼─────────────────┼──────────────────────────┤
              └─START──n─┘  └─LENGTH──n───────┘
```

Field number to be used in comparison. This keyword should only be used if the **DELIMITER** field was used in the **LAYOUT** command. Fields cannot be counted without delimiters being specified in the database. When counting, the first field after the

record id is to be considered FLDNUM 1.
To allow for the identification of a part of a field which has been numbered, you can specify the starting position (from the delimiter) and the length of the field to be used in the **WHEN** condition (the default of the *longest* parameter is the length of the longest condition or when no specific condition is specified [i.e. when change] it is from the starting position to the end of the field.)

SPACE_THEN_PRINT (Traditional only)



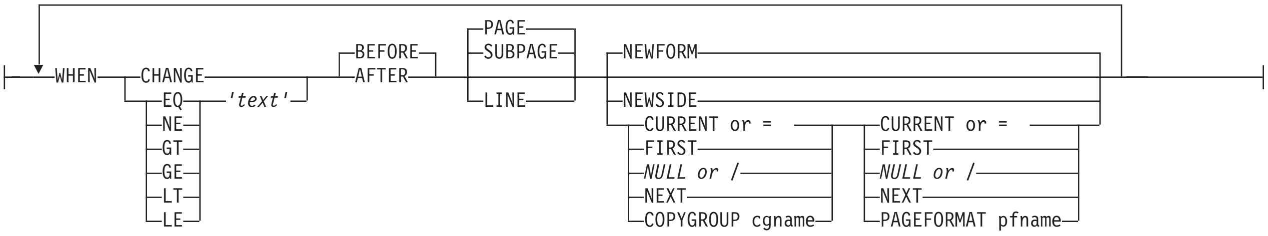
Specifies whether ANSI carriage controls for spacing are enabled for the first record on the new logical page following the execution of the **CONDITION** command. The abbreviation of this command is **SPACE**.

YES Specifies that the ANSI carriage-control character in the first print record of the new page is enabled for spacing. The spacing action specified in the carriage control is performed after the eject to the new page. For example, if the carriage-control byte in the first record of the new page is a blank (skip one line before printing), then the first record skips the first line of the new page and prints at the second printline position.

NO Specifies the ANSI carriage-control character spacing action is suppressed for the first print record of the new page. If this record contains a carriage-control spacing value, such as “blank”, “0”, or “–”, the spacing is ignored and the record prints at the first printline position on the new page. Channel code values are not ignored. If the first print record contains a valid channel code value of 1–9, or A–C, then the first record on the new page prints at the printline defined with that channel code.

Note: This subcommand is effective for print files that contain ANSI carriage controls. It is not used for data files containing machine carriage controls, or a mixture of ANSI and machine carriage controls.

WHEN



Marks the start of the conditional comparison parameters. At least one **WHEN** subcommand is required.

comparisontype= { EQ | NE | GT | GE | LT | LE }
Specifies the type of comparison that is to be

performed between the data in the comparison field (the portion of the record specified by **START** and **LENGTH**) and the constant text defined in the *text* parameter.

The choices are:

EQ	equal to
NE	not equal to
GT	greater than
GE	greater than or equal to
LT	less than
LE	less than or equal to

text

Specifies constant text for comparison with the comparison field text. The constant text length must be the same as the value on the **LENGTH** subcommand, with a maximum length of 8000 bytes. Examples of valid text are:

```
2C(3)'AB'
K'321,400'
X'41FE7799' 2 'CHARS'
```

Any values or parameters that are valid for the **TEXT** subcommand within the **FIELD** command may be used as text.

CHANGE

Specifies that the contents of the comparison field in this record are to be compared with the field in the record last processed by the same **CONDITION** command.

This parameter is an alternative to the *comparisontype* and *text* parameter combination but can be specified only once in a **CONDITION** command.

The results of the comparison is either **TRUE** or **FALSE**.

TRUE	When the contents of the comparison field have changed from one record to the next.
FALSE	When the print server processes the data, if the comparison field lies outside the boundary of the current record, which may occur with variable-length records or with truncated trailing blanks, the current record is not used in future comparisons. **CHANGE** is always false if used with the first **WHEN** subcommand of a series (no previous record to compare against). Whenever a new data map (one with a different

name) is invoked, all the **CHANGE** comparisons are reset. Field values in the previous data map are not retained.

BEFORE
Specifies that the conditional action takes place before the current line or subpage is processed. This is the default.

AFTER
Specifies that the conditional action takes place after the current line or subpage is processed.

LINE
Specifies that the conditional action takes place either before or after the current line.

SUBPAGE (Traditional only)
Specifies that the conditional action takes place either before or after the current subpage. Between **LINE** and **SUBPAGE**, **SUBPAGE** is the default.

For a description of subpages, see "Logical Page" on page 8.

PAGE (Record Format and XML only)
Specifies that the conditional action takes place either before or after the current page. This is the default. Between **LINE** and **PAGE**, **PAGE** is the default.

Note: For **CONDITION** commands in a Record Format or XML page definition, the keyword **SUBPAGE** is acceptable but obsolete. Record Format and XML page definitions do not have subpages.

NEWFORM
Specifies that the only action to be taken is skipping to the front of a new form (sheet) and restarting the page format.

Note: This parameter is an alternative to using the **COPYGROUP** and **PAGEFORMAT** parameters, and is equivalent to specifying **CURRENT** for the **COPYGROUP** parameter and **NULL** for the **PAGEFORMAT** parameter. **CURRENT NULL** are the respective defaults for **COPYGROUP** and **PAGEFORMAT** parameters; therefore, **NEWFORM** is the default action.

NEWSIDE
Specifies that the only action to be taken is skipping to a new side (either the back of the current sheet or the front of a new sheet) and restarting the page format.

Notes:

1. This parameter is an alternative to using the **COPYGROUP** and **PAGEFORMAT** parameters, and is equivalent to specifying **NULL** for the **COPYGROUP** parameter and **CURRENT** for the **PAGEFORMAT** parameter.

2. Conditional processing does not result in unnecessary blank pages.

If the line currently being processed is the first line on a side, then:

- a **COPYGROUP** or **NEWFORM** action taking effect **BEFORE LINE** does not force an additional new form.
- a **PAGEFORMAT** or **NEWSIDE** action taking effect **BEFORE LINE** does not force an additional new side.

Similarly, additional sides or forms are not forced by **BEFORE SUBPAGE** if the line currently being processed is in the first subpage on a side or a form.

copygroup options
Specifies a copy group to be invoked if the condition is true.

Note: Any copy group action (except **NULL**) restarts the page format.

{ CURRENT or = }
Invoke the current copy group again. This results in ending printing on the current sheet and resuming on the front side of a new sheet. This is the default.

The page format is restarted. This means that the first input record to go on the new page is printed using the first **PRINTLINE** command of the current page format, and so on. For example, data that was to be printed as subpage 4 on the sheet might be printed on subpage 1 on the new sheet.

Note: The character "=" can be used for **CURRENT**.

FIRST Invokes the first copy group in the current form definition.

{ NULL or / } Retains the current copy group, taking no action. The character "/" can be used for **NULL**.

NEXT Invokes the next copy group in the current form definition.

Note: If **NEXT** is specified from the last copy group in the form definition, the first copy group in the form definition is used.

COPYGROUP *cgname*
Uses the named copy group defined in the current form definition. The name must contain 1 to 8 alphanumeric characters.

pageformat options
Specifies a page format to be invoked if the condition is true.

{ CURRENT or = }
Invokes the current page format again. This results in ending printing on the current sheet and resuming on the front side of a new sheet.

The page format is restarted. This means that the first input record to go on the new page is printed using the first **PRINTLINE** command of the current page format, and so on.

The character "=" can be used for **CURRENT**.

FIRST Invokes the first page format in the current page definition.

{ <u>NULL</u> or / } Retains the current page format, taking no action. The character "/" can be used for <u>**NULL**</u>. This is the default.

NEXT Invokes the next page format in the current page definition.

Note: If **NEXT** is specified from the last page format in the page definition, the first page format in the page definition is used.

PAGEFORMAT *pfname*
Uses the named page format defined in the current page definition. The name must contain 1 to 8 alphanumeric characters.

OTHERWISE

```
├──┬──────────────────────────────────────────────────────────────────────────────┬──────────┤
   │                         ┌─PAGE────┐                                           │
   │            ┌─BEFORE─┐   ├─SUBPAGE─┤   ┌─NEWFORM──────────────────────────────┐ │
   └─OTHERWISE──┴─AFTER──┴───┴─LINE────┴───┼──────────────────────────────────────┼─┘
                                           ├─NEWSIDE──────────────────────────────┤
                                           └─┬─CURRENT or = ────┬─┬─CURRENT or = ─────┬─┘
                                             ├─FIRST────────────┤ ├─FIRST─────────────┤
                                             ├─NULL or /────────┤ ├─NULL or /─────────┤
                                             ├─NEXT─────────────┤ ├─NEXT──────────────┤
                                             └─COPYGROUP cgname─┘ └─PAGEFORMAT pfname─┘
```

Marks the start of a conditional action to be taken if all preceding **WHEN** comparisons have proved false. The syntax is the same as the **WHEN** subcommand, except that the comparison parameters (*comparisontype text* or '**CHANGE**') are not used. See the **WHEN** parameters starting with **BEFORE** on page 309 for a description of the parameters.
If the **OTHERWISE** subcommand is not used within the sequence, no action is taken. This is the same as if an **OTHERWISE NULL NULL** had been entered.

Note: **OTHERWISE** is not executed if any part of the comparison field specified by the combination of **START** and **LENGTH** is outside the boundaries of the data record.

Subcommands (Short Form)

Notes:

1. These parameters (**START** or **FLDNUM**) have the same meaning as described on the long form of the **CONDITION** command except that when the parameters are coded here they override the value coded on the long form. When not coded here, their values are inherited from the associated long form of the **CONDITION** command. Long form and short form **CONDITION** commands are associated by the use of the same “condname” parameter.
2. No other parameters can be specified on the short form of the **CONDITION** command. They are inherited from the associated long form.

START *n*

Use this parameter to specify a new starting position for the text to be tested. If this parameter is not coded, the starting position is the same as specified or defaulted in the long form of this **CONDITION**.

FLDNUM *n*

Use this parameter to specify a new field number for the text to be tested. **FLDNUM** can only be specified if the **LAYOUT** or **XLAYOUT** is coded with a delimiter.

If this parameter is not coded, the starting position is the same as specified or defaulted in the long form of this **CONDITION**.

DEFINE COLOR Command

DEFINE COLOR Command

```
►►──DEFINE──colorname──────────────────────────────────────────────────────►

►─COLOR──┬─OCA──ocacolor──────────────────────────────────────────┬─;──────►◄
         ├─RGB──rvalue──gvalue──bvalue────────────────────────────┤
         ├─CMYK──cvalue──mvalue──yvalue──kvalue───────────────────┤
         ├─HIGHLIGHT──hvalue──┬──────────────────┬──┬───────────────┬┤
         │                    └─COVERAGE──cvalue─┘  └─BLACK──bvalue─┘│
         └─CIELAB──lvalue──┬─────┬─clvalue──┬─────┬─c2value──────────┘
                           └─(–)─┘          └─(–)─┘
```

DEFINE COLOR

Defines a color name of a particular color model such as **OCA**, **RGB**, **CMYK**, **HIGHLIGHT**, or **CIELAB**. This name can be used anywhere color of that model is allowed. For example a defined color of any color model can be used as text color in the **FIELD** or **PRINTLINE** commands, but only a color defined as an **OCA** color can be used as an object placement area color. See the **OBCOLOR** subcommand in "PRINTLINE Command" on page 465.

colorname Select a 1 to 10 character name. Use this name on the command to identify this color. For example:

```
DEFINE oldblue COLOR OCA brown;
PRINTLINE   COLOR oldblue;
```

Subcommands

COLOR Specifies the color of print for this field supported in MO:DCA for the **OCA**, the Red/Green/Blue color model (**RGB**), the highlight color space, the Cyan/Magenta/Yellow/Black color model (**CMYK**), and the **CIELAB** color model.

OCA *ocacolor*

Chose one of the standard **OCA** colors or synonyms:

- **BLUE**
- **RED**
- **MAGENTA** (or **PINK**)
- **GREEN**
- **CYAN** (or **TURQ**)
- **YELLOW**
- **BLACK**
- **BROWN**
- **MUSTARD**
- **DARKBLUE** (or **DBLUE**)
- **DARKGREEN** (or **DGREEN**)
- **DARKTURQ** (**DTURQ**, or **DCYAN**, or **DARKCYAN**)
- **ORANGE**
- **PURPLE**
- **GRAY**
- **NONE**
- **DEFAULT**

Note: In some printer publications, the color turquoise (**TURQ**) is called "cyan", and the color pink (**PINK**) is called "magenta".

RGB *rvalue gvalue bvalue*

Three **RGB** integer values are used. The first (*rvalue*) represents a value for red, the second (*gvalue*) represents a value for green, and the third (*bvalue*) represents a value for blue. Each of the three integer values may be specified as a percentage from 0 to 100.

Note: An **RGB** specification of 0/0/0 is black. An **RGB** specification of 100/100/100 is white. Any other value is a color somewhere between black and white, depending on the output device.

HIGHLIGHT *hvalue* **COVERAGE** *cvalue* **BLACK** *bvalue*

Indicates the highlight color model. Highlight colors are device dependent.

You can use an integer within the range of 0 to 65,535 for the *hvalue*.

Note: An *hvalue* of 0 indicates that there is no default value defined; therefore, the default color of the presentation device is used.

COVERAGE indicates the amount of coverage of the highlight color to be used. You can use an integer within the range of 0 to 100 for the *cvalue*. If less than 100 percent is specified, the remaining coverage is achieved with the color of the medium.

Note: Fractional values are ignored. If **COVERAGE** is not specified, a value of 100 is used as a default.

BLACK indicates the percentage of black to be added to the highlight color. You can use an integer within the range of 0 to 100 for the *bvalue*. The amount of black shading applied depends on the **COVERAGE** percentage, which is applied first. If less than 100 percent is specified, the remaining coverage is achieved with black.

Note: If **BLACK** is not specified, a value of 0 is used as a default.

CMYK *cvalue mvalue yvalue kvalue*

Defines the cyan/magenta/yellow/black color model. *cvalue* specifies the cyan value. *mvalue* specifies the magenta value. *yvalue* specifies the yellow value. *kvalue* specifies the black value. You can use an integer percentage within the range of 0 to 100 for any of the **CMYK** values.

CIELAB *Lvalue* **(–)***c1value* **(–)***c2value*

Defines the **CIELAB** model. Use a range of 0.00 to 100.00 with *Lvalue* to specify the luminance value. Use signed integers from –127 to 127 with *c1value* and *c2value* to specify the chrominance differences.

Lvalue, *c1value*, *c2value* must be specified in this order. There are no defaults for the subvalues.

Note: Do not specify both an **OCA** color with the **COLOR** sub-parameter and an extended color model on the same **FIELD** or **PRINTLINE** command. The output is device dependent and may not be what you expect.

DEFINE QTAG Command (XML only)

DEFINE QTAG Command

```
                                  ┌─,────────┐
                                  ▼          │
►►──DEFINE──qtagname──QTAG────starttag───┴──;──────────────────────────►◄
```

DEFINE QTAG

Defines a local identifier for a qualified tag which can be used later in the page definition on a **XLAYOUT** command. A **QTAG** is a sequence of one or more start-tag names which taken together identify an XML data element. This is the logical equivalent of the “record IDentifier” on the **LAYOUT** command for a record formatting page definition. But, instead of identifying an entire record as the **LAYOUT** command does, the **QTAG** identifies a single XML data element.

When used, the local identifier makes the coding of an **XLAYOUT** command easier by allowing the use of a locally defined name instead of the fully-qualified set of start tags. It also makes the **XLAYOUT** command syntax similar to the **LAYOUT** command.

qtagname	The internal name assigned to the fully-qualified **QTAG**. This name can be used on the **XLAYOUT** command to identify the XML data item. This name is not case sensitive. It can be up to 16 characters in length.
starttag	An XML element name. This name must match exactly to the element name in the XML data. To preserve the case for the name, put it in quotes. Otherwise, the name is folded to upper case. If necessary, the name is translated to the datatype specified or defaulted by the **UDTYPE** subcommand on the **PAGEDEF** command. For example, if the page definition is coded on an EBCDIC platform, but the UTDTYPE specifies UTF8, PPFA converts the start tags from EBCDIC code page 500 to UTF-8.

See the “XLAYOUT Command (XML)” on page 492 for an example of using a defined **QTAG** with an **XLAYOUT** command.

DOFONT Command

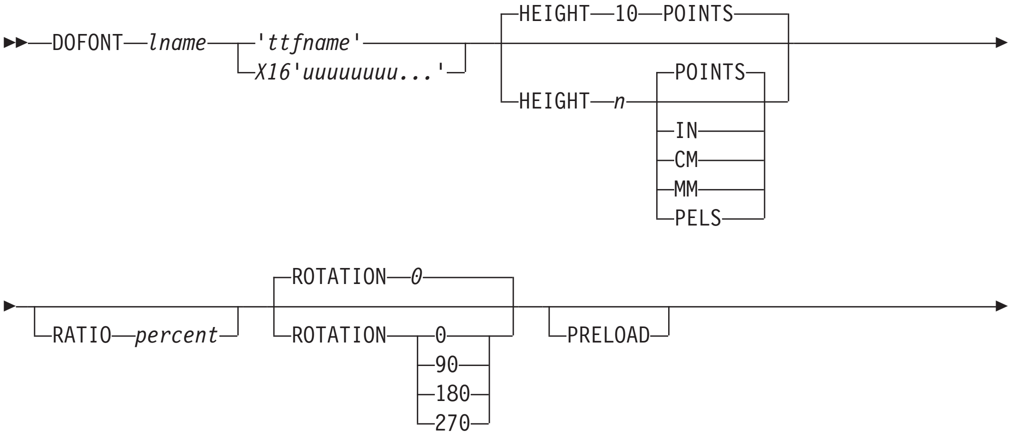
The **DOFONT** command defines a Data Object font and specifies its attributes. Data Object fonts include TrueType and OpenType fonts. A “Font Installer” is used to install Data Object fonts and a Resource Access Table (RAT). The RAT contains a table which, when accessed with the full font name provided by the user, gives the file access name for the font. All names in the RAT are encoded in UTF-16. For more information see *How To Use TrueType and OpenType Fonts in an AFP System*, G544-5876.

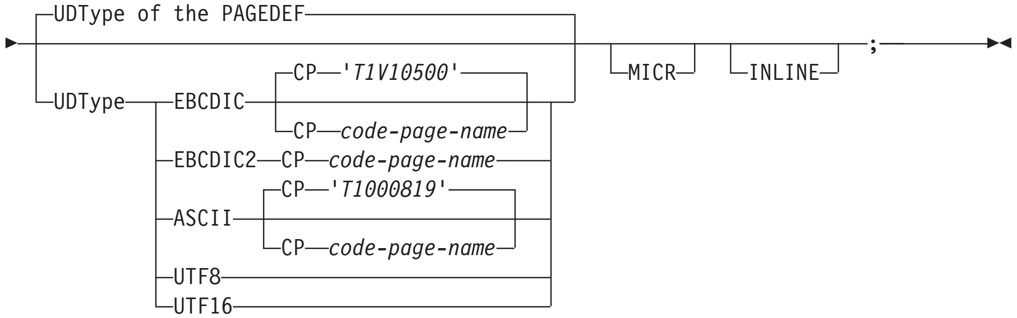
Data Object Font Support

To use Data Object fonts do the following:

- Non-PPFA requirements:
  - You must have a printer and a print server (PSF or IPM) that supports Data Object fonts.
  - You must have installed a Resource Access Table (RAT) and the Data Object fonts being used. For more information see *How To Use TrueType and OpenType Fonts in an AFP System*, G544-5876.
- PPFA requirements:
  - Define the font using a **DOFONT** command.
  - Reference the font in one of the following two ways:
    - Reference the font with the **PRINTLINE**, **LAYOUT**, **XLAYOUT**, **FIELD**, or **FIELD BARCODE** commands using the local name.
    - Use the **EXTREF** command in the appropriate **PAGEFORMAT** to create an “external” reference to any font that must be mapped but is not referenced in the above manner. For example, a BCOCA object could be presented in the page definition and that object could use a font not referenced by the page definition. The **EXTREF** command would allow the font to be mapped.

DOFONT Command





DOFONT

Defines a Data Object Font.

Font Local Name

lname

Local name for the font. Specifies an unquoted alphanumeric name of 1 to 16 characters. The name must be unique within this page definition. *lname* is the name used in the **EXTREF**, **PRINTLINE**, **LAYOUT**, **XLAYOUT**, **FIELD**, or **FIELD BARCODE** commands using **FONT** or **DOFONT** commands which reference the font.

FULL FONT NAME

The full font name of the Data Object font, for example "Times New Roman Bold".

'*ttfname***'**

Specifies a quoted, case sensitive name of the Data Object font to be used in this page definition. *Names* entered in this form are translated to UTF-16 for matching in the RAT. The name can be 1 to 125 characters long and can contain blanks. It is entered in the platform encoding (for example, ASCII or EBCDIC). The full font name is case sensitive and must match exactly the full font name in the Data Object font, including blanks. Long font names should be entered as follows:

```
 DOFONT Font1 'A very long named Helvetica Font whose name'
              ' will not fit on one line, and maybe '
              'not even on two lines'
        Height 12 points;
```

Be sure the blanks are not left out and the case (Upper or Lower) of the characters are correct.

X'16'*uuuuuuuu...***'**

The full font name of the Data Object font in Unicode UTF-16BE (Big Endian) encoding. Enter the full Unicode font name in hex digits. Four hex digits represent one Unicode code point if it isn't a surrogate. It takes eight if it is a surrogate. PPFA only checks that the entered digits are a multiple of four. The total number of hex digits entered is restricted to 500. This allows a font name of up to 125 characters (if there are no surrogates). No translation is done on the name when entered in this format. The Unicode UTF-16BE is case sensitive and must match exactly the full font name in the Data Object font, including blanks. Long font names should be entered as follows:

```
DOFONT Font1 X16'00410020007600650072007900200006C006F006E0067'
                '00200066006F006E00740020006E0061006D00650064'
                '002000480065006C007600650074006900630061'
       Height 12 points;
```

Be sure the blanks are included and the case (Upper or Lower) of the characters are correctly encoded.

Subcommands

HEIGHT

```
    ┌─HEIGHT──10──POINTS──────┐
├───┤                         ├──────────────────────────────────────────────────────────┤
    │                ┌─POINTS─┐│
    └─HEIGHT──n──────┼────────┼┘
                     ├─IN─────┤
                     ├─CM─────┤
                     ├─MM─────┤
                     └─PELS───┘
```

Specifies the height of a Data Object font.

n A number specifying the height of the Data Object font. This number can be up to 3 decimal places.

Note: If **HEIGHT** is not specified the default is 10 points.

units One of the following standard units:

POINTS
Each point is equivalent to 1/72 of an inch (default)

IN Inches

CM Centimeters

MM Millimeters

PELS Pels in the current Logical Units per inch. For example, in 240ths of an inch.

The default units are **POINTS**.

RATIO

```
├───┬────────────────┬──────────────────────────────────────────────────────────────────┤
    └─RATIO──percent─┘
```

Specifies the ratio of scaling the width relative to the height in a font.

percent
Represents the percent of the “normal” width of the character that is printed. For example, **RATIO 50** yields a font with characters half as wide as normal.

ROTATION

```
    ┌─ROTATION──0───────┐
├───┤                   ├────────────────────────────────────────────────────────────────┤
    └─ROTATION───┬─0───┬┘
                 ├─90──┤
                 ├─180─┤
                 └─270─┘
```

Specifies the rotation of characters in degrees. The specified value is relative to the inline direction of the line to be printed. Valid rotations are **0**, **90**, **180**, and **270**. Zero is the default.

PRELOAD

```
├──┬─────────┬──────────────────────────────────────────────────────────────┤
   └─PRELOAD─┘
```

If you wish the font to be preloaded prior to starting the print job, specify it here. Preloaded fonts enhance print performance. The printer must support this function.

UDType

```
   ┌─UDType of the PAGEDEF──────────────────┐
├──┼────────────────────────────────────────┼──────────────────────────────────┤
   │                    ┌─CP──'T1V10500'───┐│
   └─UDType──┬─EBCDIC───┼──────────────────┼┘
             │          └─CP──code-page-name─┘│
             ├─EBCDIC2──CP──code-page-name──┤
             │          ┌─CP──'T1000819'───┐│
             ├─ASCII────┼──────────────────┼┤
             │          └─CP──code-page-name─┘│
             ├─UTF8─────────────────────────┤
             └─UTF16────────────────────────┘
```

The **UDType** subcommand specifies the user's data type and, optionally, the code page name for mapping the font.
If **UDType** is not coded on the **DOFONT** command it defaults to the coded or default **UDType** of the page definition.

Notes:

1. Using a code page with a **UDType** specifies the code page used by the application to create the data.
2. To use multiple font mappings for a line in **ASCII**, **UTF8**, or **UTF16** you must use the **FIELD** command, since automatic font switching for single and double byte text is only done for EBCDIC data.

EBCDIC

Single byte EBCDIC.

CP

Code Page name. This parameter is optional here and, if not coded, the default is single byte EBCDIC code page "T1V10500".

code-page-name

Enter a quoted or unquoted string for the code page name. If the string is unquoted it can be up to 6 characters. The string will be folded to upper case and the two character prefix "T1" is added. If the string is quoted, it can be up to 8 characters, will retain the case, and no prefix is added.

EBCDIC2

Double byte EBCDIC.

CP

Code Page name. This parameter is mandatory.

code-page-name

Enter a quoted or unquoted string for the code page name. If the string is unquoted it can be up to 6 characters. The string is folded to upper case and the two character prefix “T1” is added. If the string is quoted it can be up to 8 characters, will retain the case, and no prefix is added.

ASCII

Single byte ASCII.

CP

Code Page name. This parameter is optional here and, if not coded, the default is single byte ASCII code page “T1000819”.

code-page-name

Enter a quoted or unquoted string for the code page name. If the string is unquoted, it can be up to 6 characters. The string is folded to upper case and the two character prefix “T1” is added. If the string is quoted, it can be up to 8 characters, will retain the case, and no prefix is added.

UTF8

Unicode encoding form UTF-8.

UTF16

Unicode encoding form UTF-16.

MICR

```
├──┬──────┬────────────────────────────────────────────────────────────┤
   └─MICR─┘
```

Specifies that this font is to be used for MICR print. MICR print defines that the font is to be used for Magnetic Ink Character Recognition (MICR) printing. When MICR printing is requested, the font needs to be designed for use in MICR applications. MICR text is normally printed using a toner that is mixed with a magnetic material.

INLINE

```
├──┬────────┬──────────────────────────────────────────────────────────┤
   └─INLINE─┘
```

Specifies that this font resource is to be found in an inline resource group when processing the line data and no additional resource libraries are to be searched. Its use is intended to correspond to a data object font resource used with complex text contained in a PTOCA text object. This PTOCA text object is included using the **OBJECT** command in PPFA.
Complex text languages provide different layouts for the presentation of text and its storage. Bi-directional (BIDI) languages present text normally from right to left; however, some text such as numbers and embedded Latin, Cyrillic and Greek scripts, are written from left to right. These languages include Arabic, Urdu, Farsi and Hebrew.

It is strongly recommended that all TrueType/OpenType fonts that are used for complex text rendering be placed in the print file resource group (inline). To ensure that only a font from the print file resource group is used by the presentation system, it is strongly recommended that the **INLINE** parameter be used for such fonts. The user is responsible for including the font in an inline printfile resource group.

Data Object Font Examples

In the page definition below there are several examples of font coding:

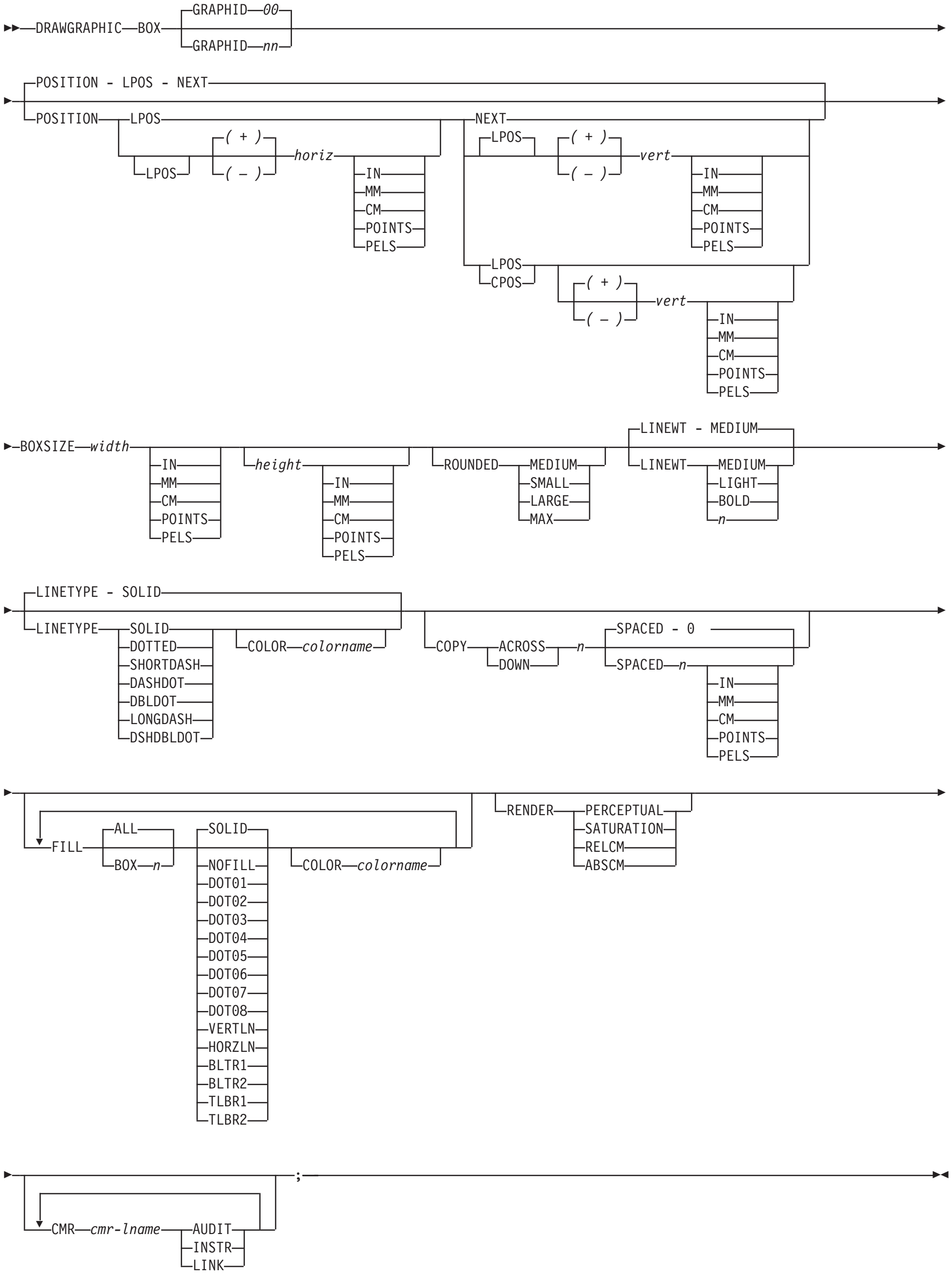
- There are 2 AFP fonts defined, *myfont* and *font1*.

- There are 4 Data Object fonts defined, *fontU*, *font2*, *font3*, and *font4*.
  - *fontU* is not referenced in the page definition, but is specified as referenced externally, because it is used in the GOCA object AmFlag.
  - Fonts *myfont*, *font1*, *font2*, *font3*, and *font4* are referenced normally on a **PRINTLINE** command.
  - *font2* uses the **UDTYPE** subcommand with a named code page.
  - *font3* specifies a height and is “preloaded”.
  - *font4* has its name specified in Unicode UTF-16BE. **(Traditional only)**
  - *font4* has its name specified in Unicode UTF-16. **(Record Format and XML only)**

```
Pagedef ttxmp1 replace yes;
  FONT   myfont 'XZM32F';
  FONT   font1 M32F;

  DOFONT fontU 'Unreferenced Font, Used in OBJECT AmFlag';
  DOFONT font2 'Times New Roman' UDTYPE EBCDIC CP 'T1V10037';
  DOFONT font3 'New Goethic Condensed'  PRELOAD Height 12;
  DOFONT font4 X16'00480065006C00760065'    /*Helve       */
                  '0074006900630061';       /* tica       */
  DOFONT micr1 'Times New Roman' HEIGHT 12  MICR;
  OBJECT amflg OBXNAME 'AmFlag' OBTYPE goca  OBKEEP;

PAGEFORMAT PF1;
  EXTREF fontU;
  Printline Font myfont;
  Printline Font font1 ;
  Printline Font font2 ;
  Printline Font font3 ;
  Printline Font font4 OBJECT amflg;
  Printline;
    FIELD Start 21 Length 16 FONT micr1;

DOFONT tnreb 'Times New Roman WT J' Height 12 UDTYPE EBCDIC
       CP 'T1V10500';
DOFONT tnreb 'Times New Roman WT J' Height 12 UDTYPE EBCDIC2
       CP 'T10300';
DOFONT tnras 'Times New Roman WT J' Height 12 UDTYPE ASCII;
DOFONT tnru8 'Times New Roman WT J' Height 12 UDTYPE UTF8;
DOFONT tnru16 'Times New Toman WT J' Height 12 UDTYPE UTF16;
```

DRAWGRAPHIC - BOX Command (Record Format and XML only)

DRAWGRAPHIC - BOX Command



The **DRAWGRAPHIC - BOX** command allows you to generate GOCA objects in order to draw boxes on the page.

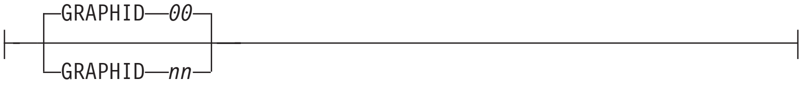
Note: GOCA boxes require specific microcode in your printer.

DRAWGRAPHIC - BOX Command (Record Format and XML only)

This command allows you to draw a box of varying attributes and colors at either the current line position or a specified position. **DRAWGRAPHIC** can be used with the **COLOR** parameter and **DEFINE COLOR** to shade a box with a percentage of black or other colors.

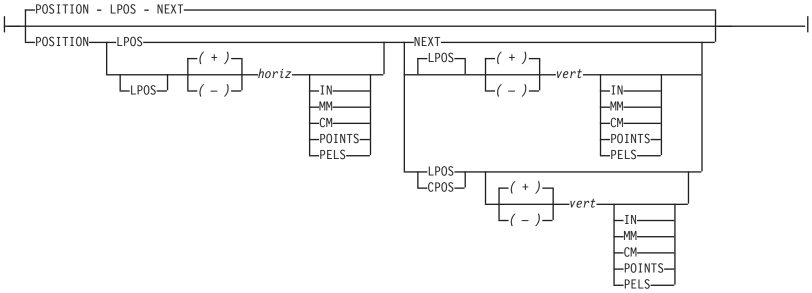
Subcommands

GRAPHID



Specified number is used to later identify as the box or set of boxes to be closed by the **ENDGRAPHIC**. The default is '00'.

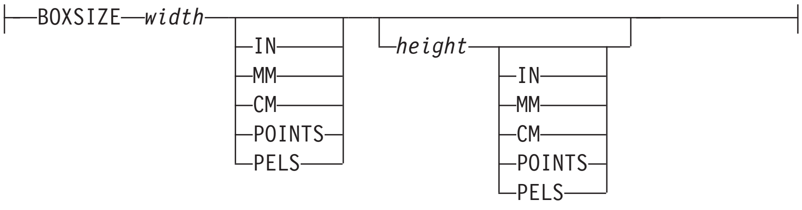
POSITION



Horizontal and vertical position for first box. This position is relative to the **LAYOUT** command's position statement or the current position.

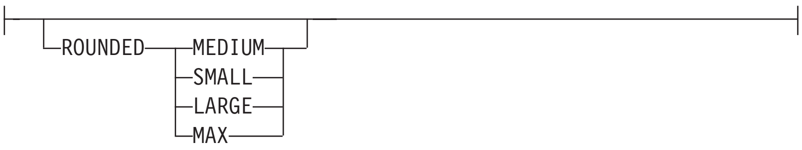
LPOS and **CPOS** refer to Layout Position and Current Position respectively. If LPOS is used alone, the position is used exactly at the same position as is specified on the **LAYOUT** command. If it is used with a + or − value, the position moves that amount from the **LAYOUT** position. The same is true for Current position except that the position is taken from the previous **FIELD** or **DRAWGRAPHIC** command.

BOXSIZE



Specify the horizontal and, optionally, vertical dimensions of the box. The first parameter is required and specifies the horizontal width of the box, which is a fixed size. The second parameter is optional and if given, specifies the fixed vertical depth of the box. If the second parameter is omitted, the box is a variable size or “floating” box. For a floating box, the depth of the box is determined when the box is closed with an **ENDGRAPHIC** command.

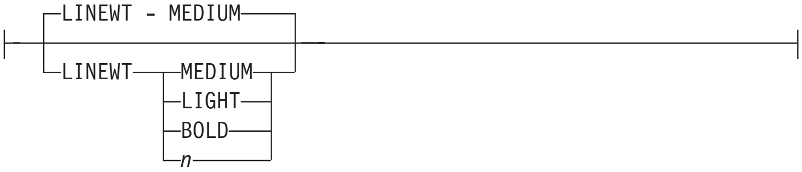
ROUNDED



Size of the rounded cornerlength is determined by the following parameters:

MEDIUM	Medium cornerlength - equates to a radius of 20 pels at 240 pels/inch or 120 pels at 1440 pels/inch
SMALL	Small cornerlength - equates to a radius of 10 pels at 240 pels/inch or 60 pels at 1440 pels/inch.
LARGE	Large cornerlength - equates to a radius of 30 pels at 240 pels/inch or 180 pels at 1440 pels/inch
MAX	Maximum cornerlength gives an arc with a radius that extends half the length of the shortest box side. If boxes are rounded **MAX**, they cannot be open-ended.

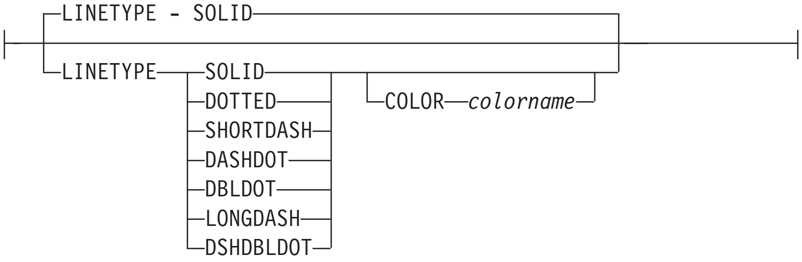
LINEWT



Specify either one of the following keywords or the number of lineweights to be used (1 lineweight = .01 inch). Specify 0 if you want invisible borders (type and color are then ignored).

LIGHT	the same as **LINEWT .01** inch.
MEDIUM	the same as **LINEWT .02** inch.
BOLD	the same as **LINEWT .03** inch.

LINETYPE



Specify one of the following keywords for the border type:

- **SOLID**
- **DOTTED**
- **SHORTDASH**
- **DASHDOT**
- **DBLDOT** (double dot)
- **LONGDASH**
- **DSHDBLDOT** (dash double dot)

COLOR
Color to be used for the box border. The colorname must be either one of the pre-defined **OCA** keywords or the colorname from the **DEFINE COLOR** command.

COPY

```
├──┬──────────────────────────────────────────────────────────┬──┤
   │                            ┌─SPACED - 0 ─────────────┐    │
   └─COPY──┬─ACROSS─┬──n──┼─────────────────────────┼────┘
           └─DOWN───┘          └─SPACED──n──┬─────────┤
                                            ├─IN──────┤
                                            ├─MM──────┤
                                            ├─CM──────┤
                                            ├─POINTS──┤
                                            └─PELS────┘
```

Repeat the same box at regular intervals either across or down the page. Total number of boxes is one more than the value specified on this parameter.

Restriction: If boxes are repeated in the **DOWN** direction, they cannot be open-ended.

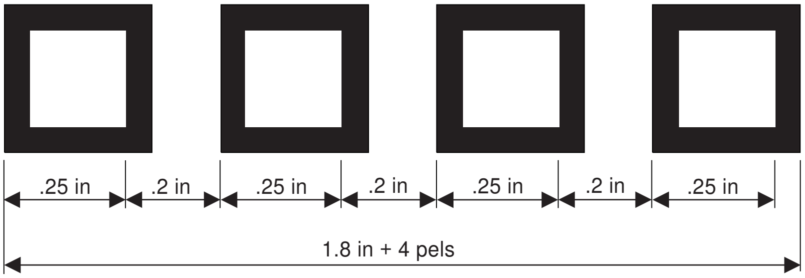


Figure 108. Spaced Boxes (not to scale).

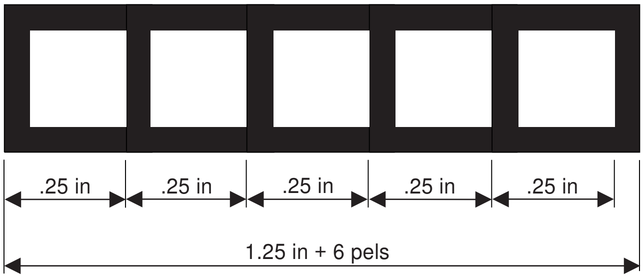
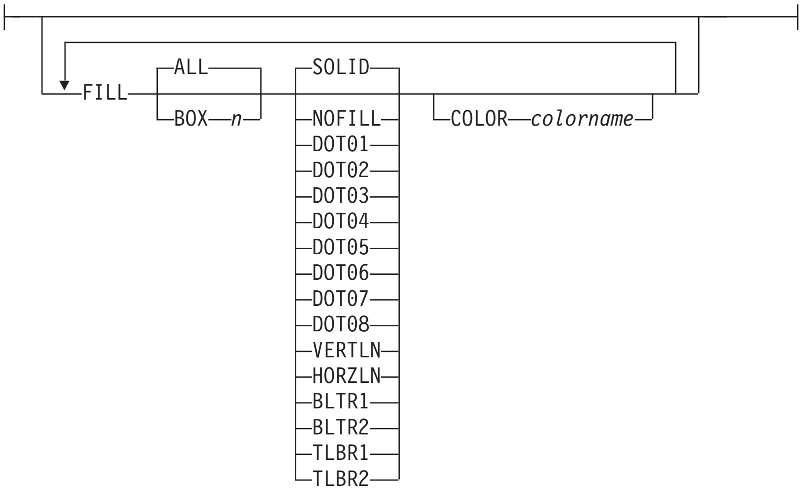


Figure 109. Boxes Spaced 0 (not to scale).

SPACED
Spacing between the boxes can be specified directly. The default is to have no space between the boxes. If there are no spaces between the boxes, the common border is shared and not duplicated.

FILL



Allows the option of filling a box with a pre-defined GOCA pattern and optionally specifying a color. The numbering of the boxes is done in the order they are defined within this one command - 1,2,3,.... Filling follows the rule that the “last fill wins”. The **NOFILL** keyword fills **ALL** boxes with one fill pattern, then specify **NOFILL** on one box to remove that box's pattern.

For an example of the various GOCA-supported fill patterns, see Figure 151 on page 613.

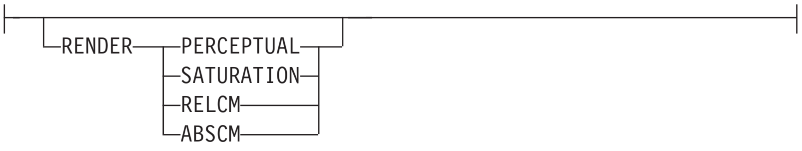
The **NOFILL** keyword can be used when a series of boxes has been specified as filled and one or more of them are to be left empty. In the example, boxes 1, 2, 4, and 5 are filled with solid blue and box 3 is empty:

```
LAYOUT ...
 Drawgraphic BOX boxsize 1 in .2 in copy down 4
 Linetype solid color green
 FILL ALL SOLID Color Blue
 FILL Box 3 NOFILL;
```

ALL
All boxes are filled.

BOX
n boxes are numbered starting at 1 for the initial box in this command, and increasing through the use of the **COPY** parameter.

RENDER



Note: See Chapter 8, “AFP Color Management,” on page 173 for more information about using the RENDER subcommand.

Subcommand on the **DRAWGRAPHIC** command to specify the rendering intent (RI) for an object within a page definition.

RI is used to modify the final appearance of color data and is defined by the International Color Consortium (ICC). For more information on RI see the current level of the ICC Specification.

rendering intent parameter Specify the rendering intent for the defined graphic (GOCA) object.

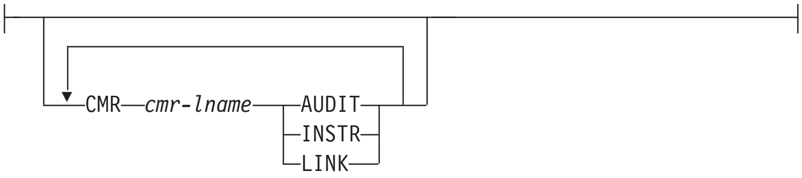
PERCEPTUAL
Perceptual rendering intent. It can be abbreviated as **PERCP**. With this rendering intent, gamut mapping is vendor-specific, and colors are adjusted to give a pleasing appearance. This intent is typically used to render continuous-tone images.

SATURATION
Saturation rendering intent. It can be abbreviated as **SATUR**. With this rendering intent, gamut mapping is vendor-specific, and colors are adjusted to emphasize saturation. This intent results in vivid colors and is typically used for business graphics.

RELCM Media-relative colorimetric rendering intent. In-gamut colors are rendered accurately, and out-of-gamut colors are mapped to the nearest value within the gamut. Colors are rendered with respect to the source white point and are adjusted for the media white point. Therefore colors printed on two different media with different white points won't match colorimetrically, but may match visually. This intent is typically used for vector graphics.

ABSCM ICC-absolute colorimetric rendering intent. In-gamut colors are rendered accurately, and out-of-gamut colors are mapped to the nearest value within the gamut. Colors are rendered only with respect to the source white point and are not adjusted for the media white point. Therefore colors printed on two different media with different white points should match colorimetrically, but may not match visually. This intent is typically used for logos.

CMR



Note: See Chapter 8, “AFP Color Management,” on page 173 for more information about using the CMR subcommand.

Specify a Color management resource (CMR) and its process mode for a graphics object within the page definition.

cmr-lname The **CMR** local name. This name must have been defined with a **DEFINE CMRNAME** command.

Note: This parameter must immediately follow the **CMR** keyword.

processing mode parameter
Specify the processing mode for the CMR.

AUDIT
Process this **CMR** as an audit CMR.

INSTR
Process this **CMR** as an instruction CMR.

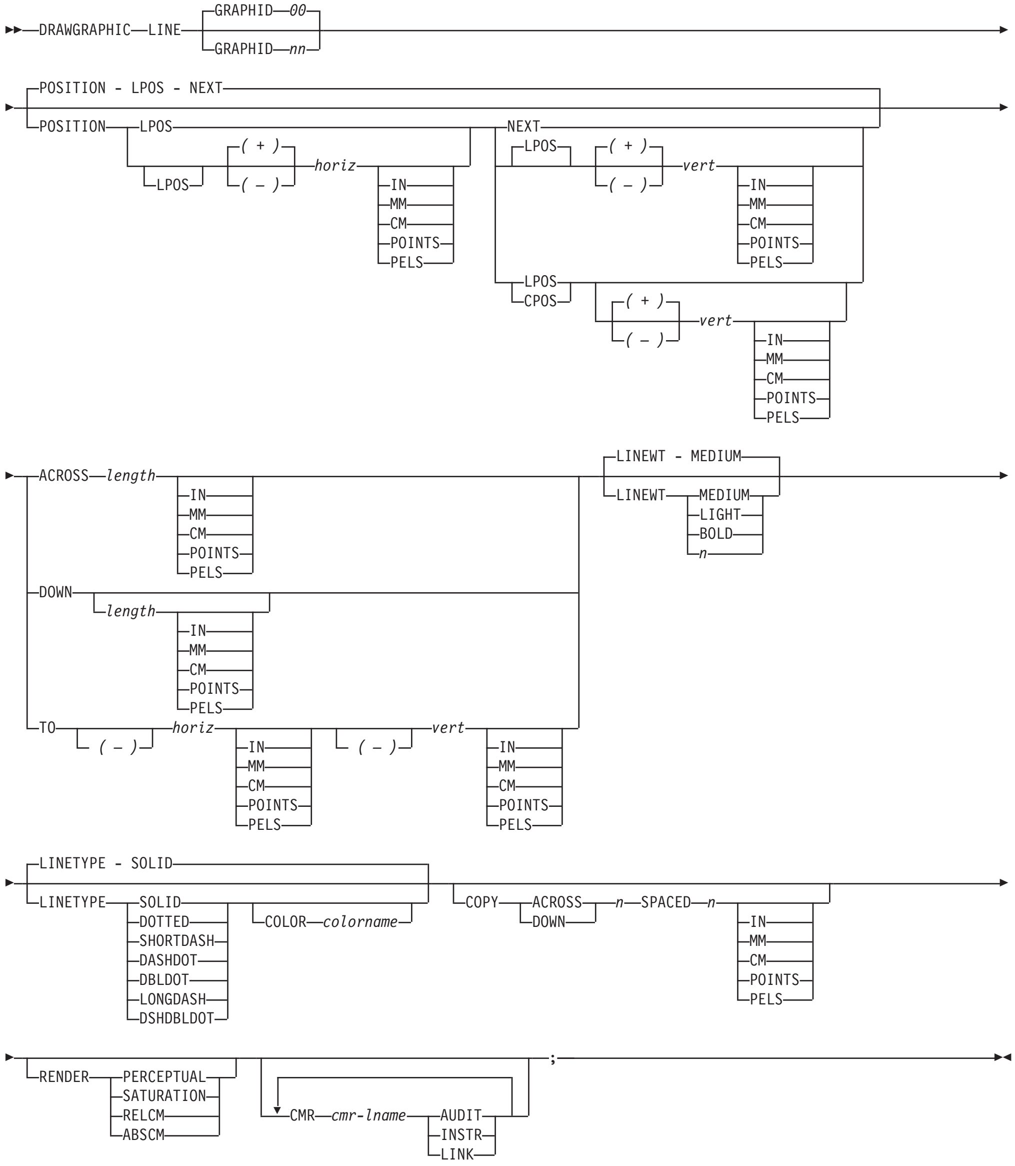
LINK
Process this **CMR** as a link CMR. This processing mode is only valid for device link (DL) CMRs.

Code Example: The following examples show how to define **CMR**s and rendering intent for graphics objects. Rendering intent and a **CMR** are defined for Record Format and XML page definitions which are the only two page definition types for which **DRAWGRAPHIC** commands are legal.

```
DEFINE mycmr  CMRNAME ... ;

PAGEDEF cmr11L  REPLACE yes;
  FONT f1;
  LAYOUT 'l1';
    DRAWGRAPHIC BOX  BOXSIZE 1 in 2 in
      RENDER relcm CMR  myCMR audit;

PAGEDEF cmr11X  REPLACE yes;
  FONT f1 TYPE ebcdic;
  XLAYOUT QTAG 'x1';
    DRAWGRAPHIC BOX  BOXSIZE 1 in 2 in
      RENDER relcm CMR  myCMR audit;
```

DRAWGRAPHIC - LINE Command (Record Format and XML only)

DRAWGRAPHIC - LINE Command



The **DRAWGRAPHIC - LINE** command allows you to use GOCA (Graphic Character Global Identifier) objects in order to draw lines on the page.

Note: GOCA lines require specific microcode in your printer.

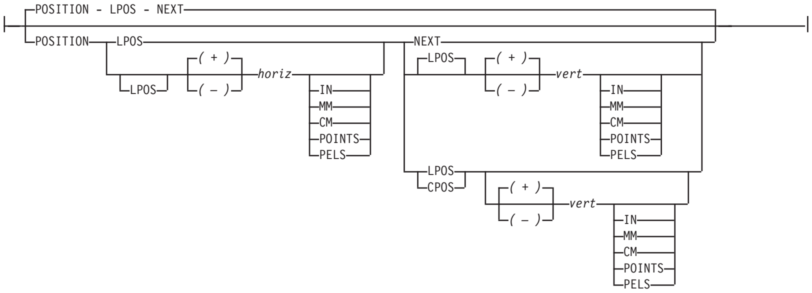
The **DRAWGRAPHIC - LINE** command allows you to create either one straight line or a series of straight lines from either the current line position or a specified position.

Subcommands

GRAPHID

Specifies a number used to later identify the graphic line to be closed by the **ENDGRAPHIC**. The default is '00'.

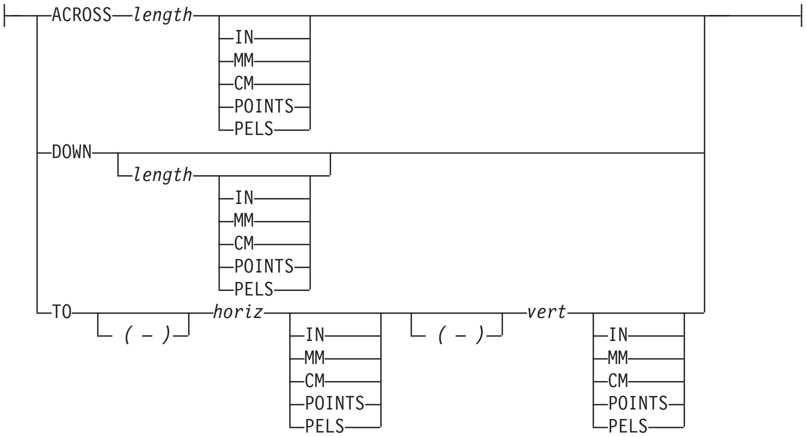
POSITION



Horizontal and vertical position for the start of the first line. This position is relative to either the Layout Position parameter or the current position.

LPOS and **CPOS** refer to Layout Position and Current Position respectively. If **LPOS** is used alone, the position is used exactly at the same position as is specified on the **LAYOUT** command. If it is used with a + or − value, the position moves that amount from the Layout position. The same is true for Current position except that the position is taken from the previous **FIELD** or **DRAWGRAPHIC** command.

ACROSS or DOWN



Specify the line length in either the **ACROSS** or **DOWN** directions. If **ACROSS** is specified, the line length must also be specified. If **DOWN** is specified and the *n units* value is not entered, the line continues until either a logical page eject is executed or an **ENDGRAPHIC** is found.

TO Horizontal and vertical ending positions for the line. Used for lines that are point-to-point. The **TO** position is specified relative to the **POSITION** parameter values in this command.

LINEWT

```
   ┌─LINEWT - MEDIUM──────┐
├──┼──────────────────────┼──────────────────────────────────────┤
   └─LINEWT──┬─MEDIUM─┬──┘
             ├─LIGHT──┤
             ├─BOLD───┤
             └─n──────┘
```

Specify either one of the following keywords or the number of lineweights to be used (1 lineweight= .01 inch).

LIGHT	the same as **LINEWT .01** inch.
MEDIUM	the same as **LINEWT .02** inch.
BOLD	the same as **LINEWT .03** inch.

LINETYPE

```
   ┌─LINETYPE - SOLID───────────────────────────────────┐
├──┼────────────────────────────────────────────────────┼──────────┤
   └─LINETYPE──┬─SOLID──────┬──┬─────────────────────┬─┘
               ├─DOTTED─────┤  └─COLOR──colorname──┘
               ├─SHORTDASH──┤
               ├─DASHDOT────┤
               ├─DBLDOT─────┤
               ├─LONGDASH───┤
               └─DSHDBLDOT──┘
```

Specify one of the following keywords for the line type:

SOLID
DOTTED
SHORTDASH
DASHDOT
DBLDOT (double dot)
LONGDASH
DSHDBLDOT (dash double dot)

COLOR
Color to be used for the line. The colorname must be either one of the pre-defined **OCA** keywords or the colorname from the **DEFINE COLOR** command.

COPY

```
├──┬──────────────────────────────────────────────────┬──────────┤
   └─COPY──┬─ACROSS─┬──n──SPACED──n──┬────────┬──┘
           └─DOWN───┘                ├─IN─────┤
                                     ├─MM─────┤
                                     ├─CM─────┤
                                     ├─POINTS─┤
                                     └─PELS───┘
```

Repeat the same line at regular intervals either across or down the page. Total number of lines is one more than the value specified on this parameter.

RENDER

```
├─┬──────────────────────────┬─────────────────────────────────┤
  └─RENDER──┬─PERCEPTUAL─┬─┘
            ├─SATURATION─┤
            ├─RELCM──────┤
            └─ABSCM──────┘
```

Note: See Chapter 8, “AFP Color Management,” on page 173 for more information about using the RENDER subcommand.

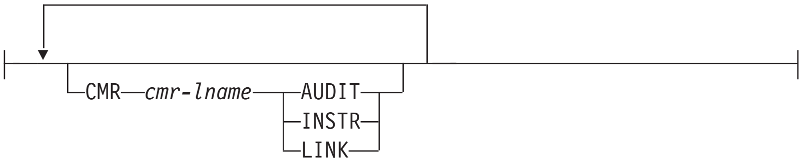
Subcommand on the **DRAWGRAPHIC** command to specify the rendering intent (RI) for an object within a page definition.

RI is used to modify the final appearance of color data and is defined by the International Color Consortium (ICC). For more information on RI see the current level of the ICC Specification.

rendering intent parameter Specify the rendering intent for the defined graphic (GOCA) object.

PERCEPTUAL	Perceptual rendering intent. It can be abbreviated as **PERCP**. With this rendering intent, gamut mapping is vendor-specific, and colors are adjusted to give a pleasing appearance. This intent is typically used to render continuous-tone images.
SATURATION	Saturation rendering intent. It can be abbreviated as **SATUR**. With this rendering intent, gamut mapping is vendor-specific, and colors are adjusted to emphasize saturation. This intent results in vivid colors and is typically used for business graphics.
RELCM	Media-relative colorimetric rendering intent. In-gamut colors are rendered accurately, and out-of-gamut colors are mapped to the nearest value within the gamut. Colors are rendered with respect to the source white point and are adjusted for the media white point. Therefore colors printed on two different media with different white points won't match colorimetrically, but may match visually. This intent is typically used for vector graphics.
ABSCM	ICC-absolute colorimetric rendering intent. In-gamut colors are rendered accurately, and out-of-gamut colors are mapped to the nearest value within the gamut. Colors are rendered only with respect to the source white point and are not adjusted for the media white point. Therefore colors printed on two different media with different white points should match colorimetrically, but may not match visually. This intent is typically used for logos.

CMR



Note: See Chapter 8, "AFP Color Management," on page 173 for more information about using the CMR subcommand.

Specify a Color management resource (CMR) and its process mode for a graphics object within the page definition.

cmr-lname
The **CMR** local name. This name must have been defined with a **DEFINE CMRNAME** command.

Note: This parameter must immediately follow the **CMR** keyword.

processing mode parameter
Specify the processing mode for the CMR.

AUDIT
Process this **CMR** as an audit CMR.

INSTR
Process this **CMR** as an instruction CMR.

LINK
Process this **CMR** as a link CMR. This processing mode is only valid for device link (DL) CMRs.

Code Example: The following examples show how to define **CMR**s and rendering intent for graphics objects. Rendering intent and a **CMR** are defined for Record Format and XML page definitions which are the only two page definition types for which **DRAWGRAPHIC** commands are legal.

```
DEFINE mycmr  CMRNAME ... ;

PAGEDEF cmr11L  REPLACE yes;
  FONT f1;
  LAYOUT 'l1';
    DRAWGRAPHIC BOX  BOXSIZE 1 in 2 in
      RENDER relcm CMR  myCMR audit;

PAGEDEF cmr11X  REPLACE yes;
  FONT f1 TYPE ebcdic;
  XLAYOUT QTAG 'x1';
    DRAWGRAPHIC BOX  BOXSIZE 1 in 2 in
      RENDER relcm CMR  myCMR audit;
```

DRAWGRAPHIC - CIRCLE Command (Record Format and XML only)

DRAWGRAPHIC - CIRCLE Command

```
►►──DRAWGRAPHIC──CIRCLE─────────────────────────────────────────────────────────────────►

   ┌─POSITION - LPOS - NEXT────────────────────────────────────────────────────────┐
►──┴─POSITION──┬─LPOS───────────────────────────┬─NEXT─────────────────────────────┬─┴──►
               │        ┌─( + )─┐                │ ┌─LPOS─┐  ┌─( + )─┐               │
               └─┬──────┬┴───────┴─horiz─┬────────┬┘ ├──────┴──┴───────┴─vert─┬────────┬─┤
                 └─LPOS─┘└─( – )─┘        ├─IN─────┤  │          └─( – )─┘     ├─IN─────┤ │
                                          ├─MM─────┤  │                        ├─MM─────┤ │
                                          ├─CM─────┤  │                        ├─CM─────┤ │
                                          ├─POINTS─┤  │                        ├─POINTS─┤ │
                                          └─PELS───┘  │                        └─PELS───┘ │
                                                      └─┬─LPOS─┬─┬─────────────────────────┬┘
                                                        └─CPOS─┘ │  ┌─( + )─┐              │
                                                                 └─┬┴───────┴─vert─┬────────┬┘
                                                                   └─( – )─┘       ├─IN─────┤
                                                                                   ├─MM─────┤
                                                                                   ├─CM─────┤
                                                                                   ├─POINTS─┤
                                                                                   └─PELS───┘

                      ┌─LINEWT - MEDIUM──────┐  ┌─LINETYPE - SOLID──────────────────────────┐
►─RADIUS──n──┬────────┬─┴─LINEWT──┬─MEDIUM─┬─┴──┴─LINETYPE──┬─SOLID─────┬──┬──────────────────┬┴──►
             ├─IN─────┤           ├─LIGHT──┤                ├─DOTTED────┤  └─COLOR──colorname─┘
             ├─MM─────┤           ├─BOLD───┤                ├─SHORTDASH─┤
             ├─CM─────┤           └─n──────┘                ├─DASHDOT───┤
             ├─POINTS─┤                                     ├─DBLDOT────┤
             └─PELS───┘                                     ├─LONGDASH──┤
                                                            └─DSHDBLDOT─┘

►──┬─────────────────────────────────────────────────┬──────────────────────────────────────►
   │                          ┌─SPACED - DIAMETER ─┐  │
   └─COPY──┬─ACROSS─┬──n──────┴─SPACED──n──┬────────┬┴─┘
           └─DOWN───┘                      ├─IN─────┤
                                           ├─MM─────┤
                                           ├─CM─────┤
                                           ├─POINTS─┤
                                           └─PELS───┘

►──┬─────────────────────────────────────────────────────────┬──┬────────────────────────────┬─►
   │ ┌───────────────────────────────────────────────────┐  │  └─RENDER──┬─PERCEPTUAL─┬──┘
   │ ▼        ┌─ALL──────┐  ┌─SOLID──┐                    │  │            ├─SATURATION─┤
   └───FILL───┴─CIRCLE──n─┴──┼─NOFILL─┼──┬──────────────────┬┴──┘            ├─RELCM──────┤
                             ├─DOT01──┤  └─COLOR──colorname─┘                └─ABSCM──────┘
                             ├─DOT02──┤
                             ├─DOT03──┤
                             ├─DOT04──┤
                             ├─DOT05──┤
                             ├─DOT06──┤
                             ├─DOT07──┤
                             ├─DOT08──┤
                             ├─VERTLN─┤
                             ├─HORZLN─┤
                             ├─BLTR1──┤
                             ├─BLTR2──┤
                             ├─TLBR1──┤
                             └─TLBR2──┘

►──┬──────────────────────────────────┬─;─────────────────────────────────────────────────►◄
   │ ┌─────────────────────────────┐  │
   │ ▼                              │  │
   └───CMR──cmr-lname──┬─AUDIT─┬───┴──┘
                       ├─INSTR─┤
                       └─LINK──┘
```

The **DRAWGRAPHIC - CIRCLE** command allows you to generate GOCA (Graphics Object Content Architecture) objects in order to draw circles on the page.

Note: GOCA circles require specific microcode in your printer.

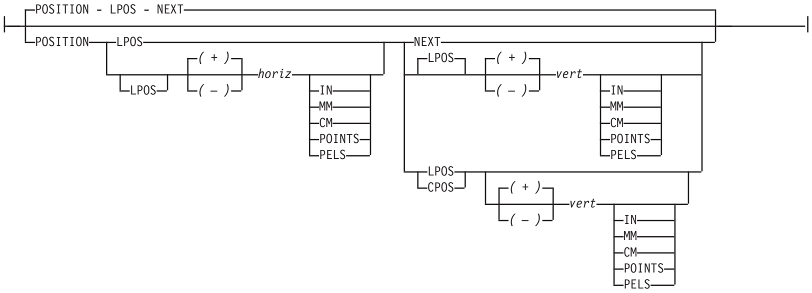
DRAWGRAPHIC - CIRCLE Command (Record Format and XML only)

The **DRAWGRAPHIC - CIRCLE** command allows you to create a circle at either a specified radial distance from the last line printed or a specified position.

DRAWGRAPHIC can be used with the **COLOR** parameter and **DEFINE COLOR** to shade a circle with a percentage of black or other colors.

Subcommands

POSITION



Horizontal and vertical position of the center of the first circle. This position value is relative to either the Layout Position parameter or the current position.

LPOS and **CPOS** refer to Layout Position and Current Position respectively. If **LPOS** is used alone, the position is used exactly at the same position as is specified on the **LAYOUT** command. If it is used with a + or – value, the position moves that amount from the Layout position. The same is true for Current position except that the position is taken from the previous **FIELD** or **DRAWGRAPHIC** command.

RADIUS

Specify the circle radius. (The radius is measured from the center of the circle to the middle of the line width.)

LINEWT

Specify either one of the following keywords or the number of lineweights to be used (1 lineweight = .01 inch). Specify 0 if you want invisible borders (type and color are then ignored).

LIGHT	the same as **LINEWT .01** inch.
MEDIUM	the same as **LINEWT .02** inch.

BOLD the same as **LINEWT .03** inch.

LINETYPE

```
   ┌─LINETYPE - SOLID───────────────────────────────────────┐
├──┤                                                        ├──────────┤
   └─LINETYPE──┬─SOLID──────┬──┬────────────────────────┬───┘
               ├─DOTTED─────┤  └─COLOR──colorname───────┘
               ├─SHORTDASH──┤
               ├─DASHDOT────┤
               ├─DBLDOT─────┤
               ├─LONGDASH───┤
               └─DSHDBLDOT──┘
```

Specify one of the following keywords for the line type:
- **SOLID**
- **DOTTED**
- **SHORTDASH**
- **DASHDOT**
- **DBLDOT** (double dot)
- **LONGDASH**
- **DSHDBLDOT** (dash double dot)

COLOR

Color to be used for the circle border. The colorname must be one of the pre-defined **OCA** keywords or the colorname from the **DEFINE COLOR** command.

COPY

```
├──┬────────────────────────────────────────────────────────┬──────────┤
   │                        ┌─SPACED - DIAMETER───────┐     │
   └─COPY──┬─ACROSS─┬──n────┤                         ├─────┘
           └─DOWN───┘       └─SPACED──n──┬─────────┬──┘
                                         ├─IN──────┤
                                         ├─MM──────┤
                                         ├─CM──────┤
                                         ├─POINTS──┤
                                         └─PELS────┘
```

Repeat the same circle at regular intervals either across or down the page. Repeating **ACROSS** or **DOWN** with the **DIAMETER** indication means that the circles are placed to join at one point with the center positions of each being one diameter width apart. See following figures for a pictorial view of repeating circles. Total number of circles is one more than the value specified on this parameter.

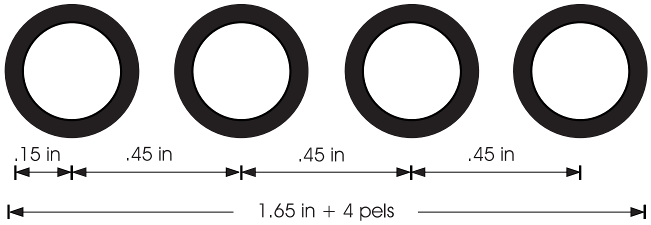


Figure 110. Repeating circles with .45 inch spacing (not to scale).

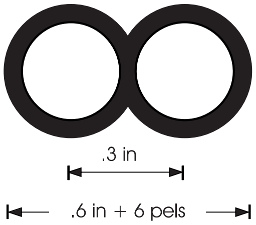
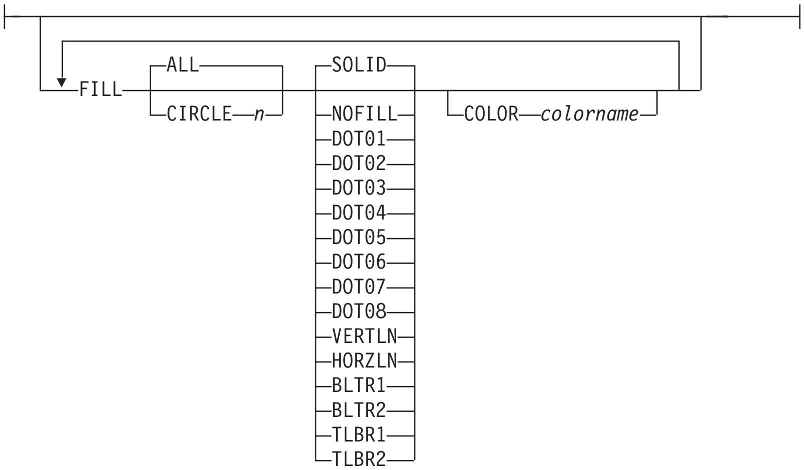


Figure 111. Repeating circles with **DIAMETER** *spacing (not to scale).*

FILL

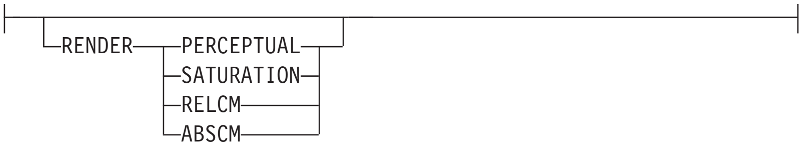


Allows the option of filling a circle with a pre-defined GOCA pattern and optionally specifying a color. Circles are numbered in the order they are defined within this command - 1,2,3,.... Filling follows the rule that the "last fill wins".

Using the **NOFILL** keyword fills **ALL** circles with one fill pattern. Then specify **NOFILL** on one circle to remove that circle's pattern.

For an example of the various GOCA-supported fill patterns, see Figure 151 on page 613.

RENDER



Note: See Chapter 8, "AFP Color Management," on page 173 for more information about using the RENDER subcommand.
Subcommand on the **DRAWGRAPHIC** command to specify the rendering intent (RI) for an object within a page definition.

RI is used to modify the final appearance of color data and is defined by the International Color Consortium (ICC). For more information on RI see the current level of the ICC Specification.

rendering intent parameter Specify the rendering intent for the defined graphic (GOCA) object.

PERCEPTUAL	Perceptual rendering intent. It can be abbreviated as **PERCP**. With this rendering intent, gamut mapping is vendor-specific, and colors are adjusted to give a pleasing appearance. This intent is typically used to render continuous-tone images.
SATURATION	Saturation rendering intent. It can be abbreviated as **SATUR**. With this rendering intent, gamut mapping is vendor-specific, and colors are adjusted to emphasize saturation. This intent results in vivid colors and is typically used for business graphics.
RELCM	Media-relative colorimetric rendering intent. In-gamut colors are rendered accurately, and out-of-gamut colors are mapped to the nearest value within the gamut. Colors are rendered with respect to the source white point and are adjusted for the media white point. Therefore colors printed on two different media with different white points won't match colorimetrically, but may match visually. This intent is typically used for vector graphics.
ABSCM	ICC-absolute colorimetric rendering intent. In-gamut colors are rendered accurately, and out-of-gamut colors are mapped to the nearest value within the gamut. Colors are rendered only with respect to the source white point and are not adjusted for the media white point. Therefore colors printed on two different media with different white points should match colorimetrically, but may not match visually. This intent is typically used for logos.

CMR

```
    ┌─────────────────────────────────┐
    ▼                                 │
├───┬─────────────────────────────────┴──────────────────────────────┤
    └─CMR──cmr-lname──┬─AUDIT─┬─┘
                      ├─INSTR─┤
                      └─LINK──┘
```

Note: See Chapter 8, “AFP Color Management,” on page 173 for more information about using the CMR subcommand.

Specify a Color management resource (CMR) and its process mode for a graphics object within the page definition.

cmr-lname	The **CMR** local name. This name must have been defined with a **DEFINE CMRNAME** command. **Note:** This parameter must immediately follow the **CMR** keyword.
processing mode parameter	Specify the processing mode for the CMR.

AUDIT
Process this **CMR** as an audit CMR.

INSTR
Process this **CMR** as an instruction CMR.

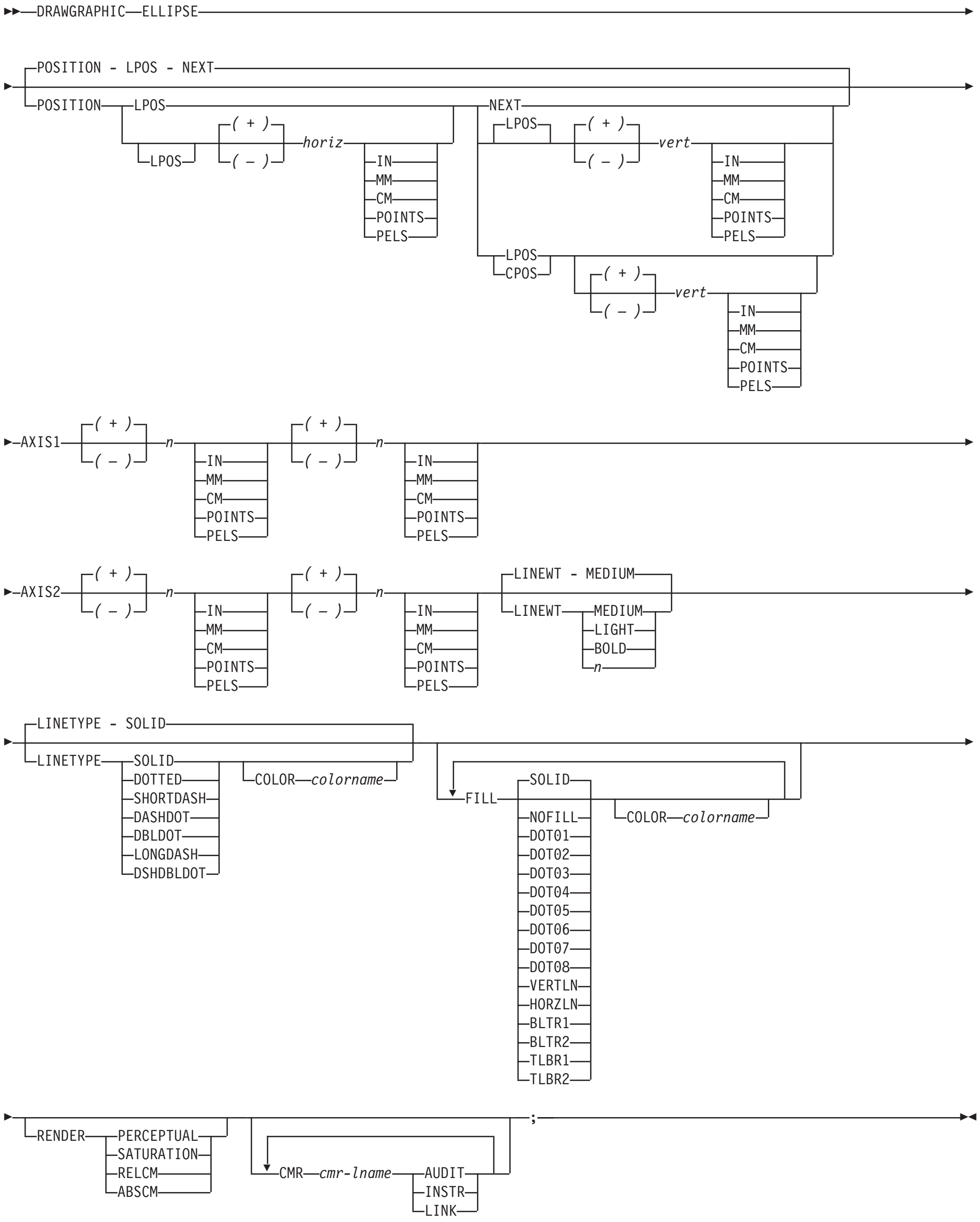
LINK
Process this **CMR** as a link CMR. This processing mode is only valid for device link (DL) CMRs.

Code Example: The following examples show how to define **CMR**s and rendering intent for graphics objects. Rendering intent and a **CMR** are defined for Record Format and XML page definitions which are the only two page definition types for which **DRAWGRAPHIC** commands are legal.

```
DEFINE mycmr  CMRNAME ... ;

PAGEDEF cmr11L  REPLACE yes;
  FONT f1;
  LAYOUT 'l1';
    DRAWGRAPHIC BOX  BOXSIZE 1 in 2 in
      RENDER relcm CMR  myCMR audit;

PAGEDEF cmr11X  REPLACE yes;
  FONT f1 TYPE ebcdic;
  XLAYOUT QTAG 'x1';
    DRAWGRAPHIC BOX  BOXSIZE 1 in 2 in
      RENDER relcm CMR  myCMR audit;
```

DRAWGRAPHIC - ELLIPSE Command (Record Format and XML only)

DRAWGRAPHIC - ELLIPSE Command



The **DRAWGRAPHIC - ELLIPSE** command allows you to draw ellipses on the page by generating GOCA (Graphics Object Content Architecture) structure fields.

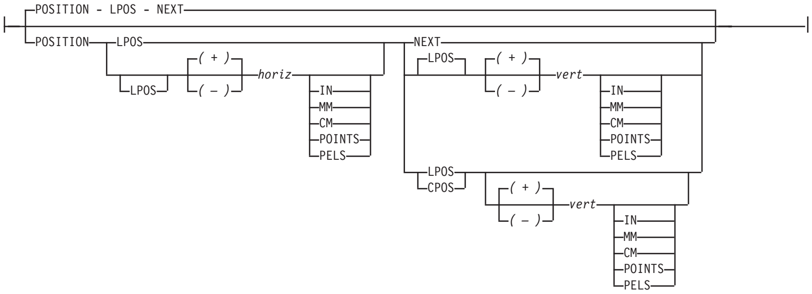
Note: GOCA lines require specific microcode in your printer.

The **DRAWGRAPHIC - ELLIPSE** command allows you to create an ellipse with a number of positions showing the major and minor axes at a specified distance from the last line printed.

The **DRAWGRAPHIC** can be used with the **COLOR** parameter and **DEFINE COLOR** to shade an ellipse with a percentage of black or other colors.

Subcommands

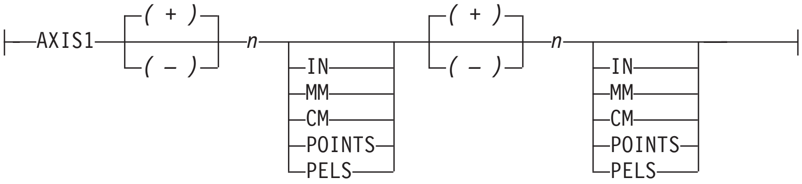
POSITION



Horizontal and vertical position of the ellipse.

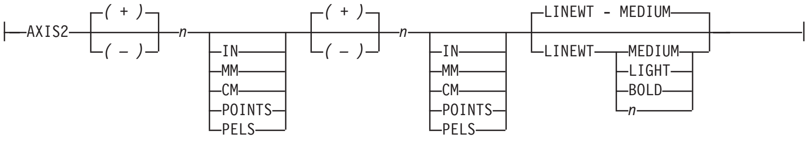
LPOS and **CPOS** refer to Layout Position and Current Position respectively. If **LPOS** is used alone, the position is used exactly at the same position as is specified on the **LAYOUT** command. If it is used with a + or − value, the position moves that amount from the Layout position. The same is true for Current position except that the position is taken from the previous **FIELD** or **DRAWGRAPHIC** command.

AXIS1



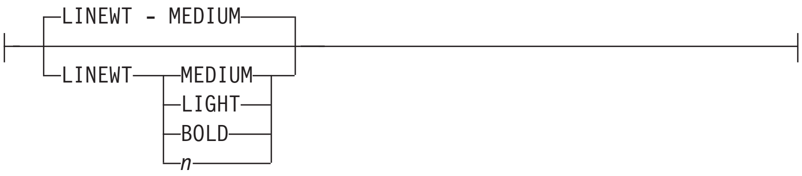
The first pair of *n units* specifies the location of one point on the ellipse specified in relation to the **POSITION** parameter on this command. This location is specified as if the **POSITION** parameter is now at (0,0) on a coordinate system. The *x* and *y* movements are either in the positive or negative direction from the center point at (0,0). For a picture of how this is used, see Figure 112 on page 344. Point R,Q.

AXIS2



The second pair of *n units* specifies the location of second point on the ellipse specified in relation to the **POSITION** parameter on this command. This location is specified as if the **POSITION** parameter is now at (0,0) on a coordinate system. The *x* and *y* movements are either in the positive or negative direction from the center point at (0,0). For a picture of how this is used, see Figure 112 on page 344. Point P,S.

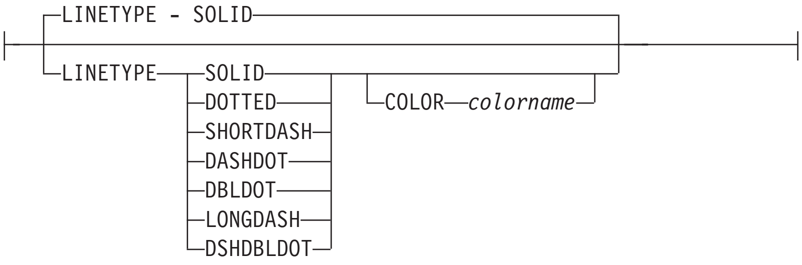
LINEWT



Specify either a keyword or the number of lineweights to be used (1 lineweight = .01 inch). Specify 0 if you want invisible borders (type and color are then ignored).

LIGHT	the same as **LINEWT .01** inch.
MEDIUM	the same as **LINEWT .02** inch.
BOLD	the same as **LINEWT .03** inch.

LINETYPE



Specify one of the following keywords for the line type:

SOLID
DOTTED
SHORTDASH
DASHDOT
DBLDOT (double dot)
LONGDASH
DSHDBLDOT (dash double dot)

COLOR

Color to be used for the ellipse border. Specify either one of the pre-defined **OCA** keywords or the colorname from the **DEFINE COLOR** command.

FILL

DRAWGRAPHIC - ELLIPSE Command (Record Format and XML only)

```
├──┬──────────────────────────────────────────────┬──────────┤
   │ ┌──────────────────────────────────────────┐  │
   │ ▼       ┌─SOLID──┐                         │  │
   └─FILL────┤        ├──┬────────────────────┬─┴──┘
             ├─NOFILL─┤  └─COLOR──colorname───┘
             ├─DOT01──┤
             ├─DOT02──┤
             ├─DOT03──┤
             ├─DOT04──┤
             ├─DOT05──┤
             ├─DOT06──┤
             ├─DOT07──┤
             ├─DOT08──┤
             ├─VERTLN─┤
             ├─HORZLN─┤
             ├─BLTR1──┤
             ├─BLTR2──┤
             ├─TLBR1──┤
             └─TLBR2──┘
```

Allows the option of filling an ellipse with a pre-defined GOCA pattern and optionally specifying a filling color. For an example of the various GOCA-supported fill patterns, see Appendix G, “PPFA Media Names,” on page 611 Figure 151 on page 613.

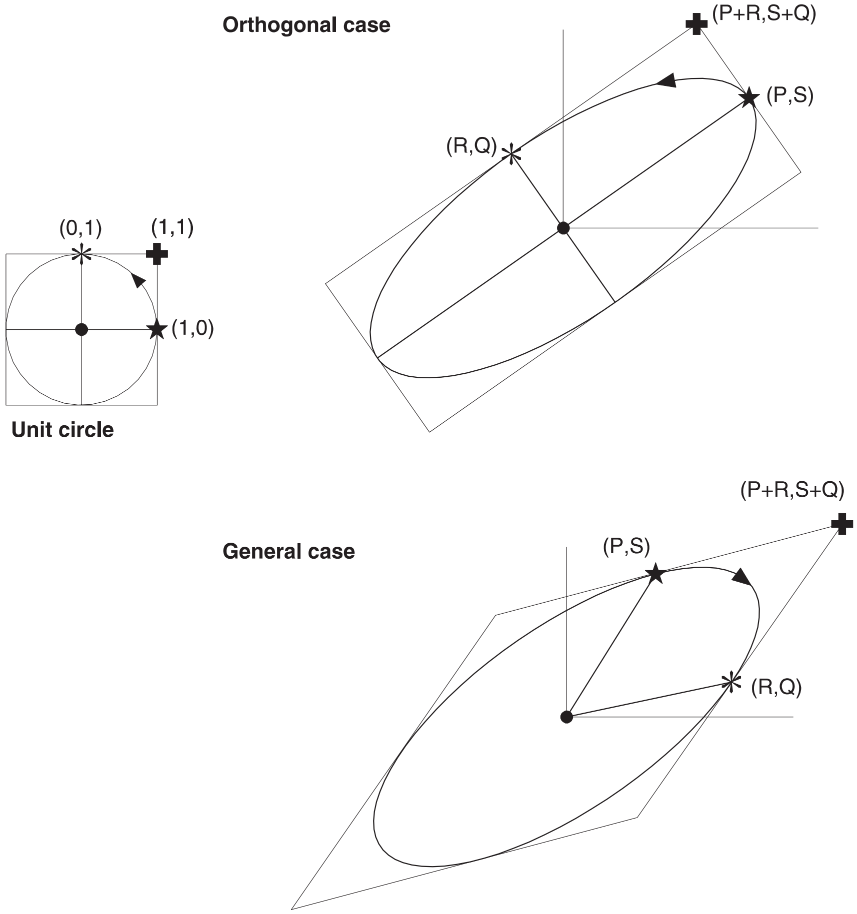


Figure 112. Ellipse parameters

The dot in the center of the ellipse shows the **POSITION** parameter. The asterisk shows the major axis position and star shows the minor axis position.

RENDER

```
├──┬──────────────────────────┬──────────────────────────────────────────┤
   └─RENDER──┬─PERCEPTUAL─┬─┘
             ├─SATURATION─┤
             ├─RELCM──────┤
             └─ABSCM──────┘
```

Note: See Chapter 8, “AFP Color Management,” on page 173 for more information about using the RENDER subcommand.

Subcommand on the **DRAWGRAPHIC** command to specify the rendering intent (RI) for an object within a page definition.

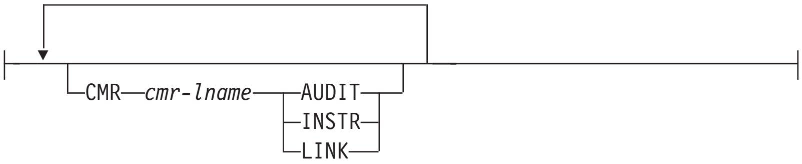
RI is used to modify the final appearance of color data and is defined by the International Color Consortium (ICC). For more information on RI see the current level of the ICC Specification.

rendering intent parameter Specify the rendering intent for the defined graphic (GOCA) object.

PERCEPTUAL	Perceptual rendering intent. It can be abbreviated as **PERCP**. With this rendering intent, gamut mapping is vendor-specific, and colors are adjusted to give a pleasing appearance. This intent is typically used to render continuous-tone images.
SATURATION	Saturation rendering intent. It can be abbreviated as **SATUR**. With this rendering intent, gamut mapping is vendor-specific, and colors are adjusted to emphasize saturation. This intent results in vivid colors and is typically used for business graphics.
RELCM	Media-relative colorimetric rendering intent. In-gamut colors are rendered accurately, and out-of-gamut colors are mapped to the nearest value within the gamut. Colors are rendered with respect to the source white point and are adjusted for the media white point. Therefore colors printed on two different media with different white points won't match colorimetrically, but may match visually. This intent is typically used for vector graphics.
ABSCM	ICC-absolute colorimetric rendering intent. In-gamut colors are rendered accurately, and out-of-gamut colors are mapped to the nearest value within the gamut. Colors are rendered only with respect to the source white point and are not adjusted for the media white point. Therefore colors printed on two different media with different white points should match

colorimetrically, but may not match visually. This intent is typically used for logos.

CMR



Note: See Chapter 8, “AFP Color Management,” on page 173 for more information about using the CMR subcommand.

Specify a Color management resource (CMR) and its process mode for a graphics object within the page definition.

cmr-lname
The **CMR** local name. This name must have been defined with a **DEFINE CMRNAME** command.

Note: This parameter must immediately follow the **CMR** keyword.

processing mode parameter
Specify the processing mode for the CMR.

AUDIT
Process this **CMR** as an audit CMR.

INSTR
Process this **CMR** as an instruction CMR.

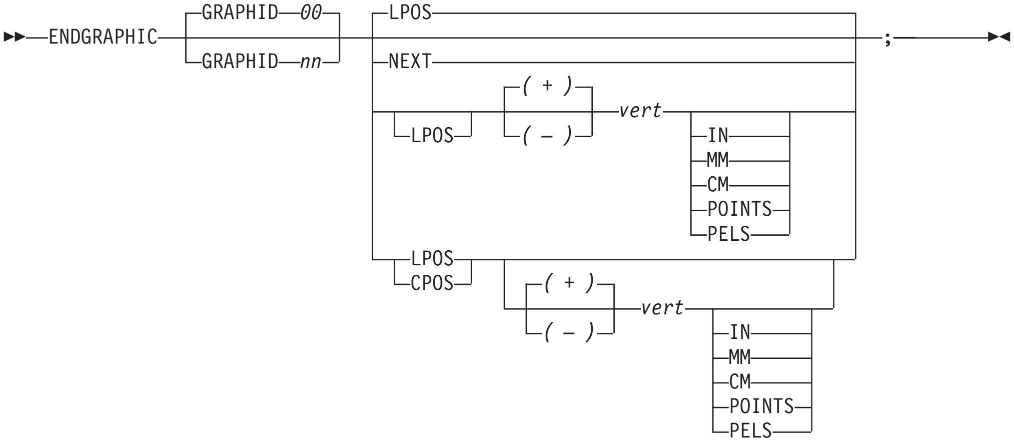
LINK
Process this **CMR** as a link CMR. This processing mode is only valid for device link (DL) CMRs.

Code Example: The following examples show how to define **CMR**s and rendering intent for graphics objects. Rendering intent and a **CMR** are defined for Record Format and XML page definitions which are the only two page definition types for which **DRAWGRAPHIC** commands are legal.

```
DEFINE mycmr  CMRNAME ... ;

PAGEDEF cmr11L  REPLACE yes;
  FONT f1;
  LAYOUT 'l1';
    DRAWGRAPHIC BOX  BOXSIZE 1 in 2 in
      RENDER relcm CMR  myCMR audit;

PAGEDEF cmr11X  REPLACE yes;
  FONT f1 TYPE ebcdic;
  XLAYOUT QTAG 'x1';
    DRAWGRAPHIC BOX  BOXSIZE 1 in 2 in
      RENDER relcm CMR  myCMR audit;
```

ENDGRAPHIC Command (Record Format and XML only)

ENDGRAPHIC Command



The **ENDGRAPHIC** command allows you to end all active graphics with a matching graphic id. An active graphic is one that has been started but not ended, for example a vertical line or a box with no vertical size.

Subcommands

GRAPHID	ID must match one previously defined in a **DRAWGRAPHIC** command. If no **GRAPHID** is specified, all **DRAWGRAPHIC** commands that have no **GRAPHID** are closed (for example, **GRAPHID 00**).
NEXT	Specifies the layout is to be positioned down (on the logical page) one line (as defined in the **LINESP** subcommand of the last **SETUNITS** command) from the previous field. The **LINESP** subcommand of the **SETUNITS** command establishes the distance from one line to the next.
LPOS **CPOS**	**LPOS** and **CPOS** refer to Layout Position and Current Position respectively. If **LPOS** is used alone, the position is used exactly at the same position as is specified on the **LAYOUT** command. If it is used with a + or – value, the position moves that amount from the Layout position. The same is true for Current position except that the position is taken from the previous **FIELD** or **DRAWGRAPHIC** command.
vert	This value is relative to the Layout position. If not specified, the graphics are closed one line spacing from the Layout position.

ENDSUBPAGE Command (Traditional Only)

ENDSUBPAGE Command

```
►►──ENDSUBPAGE──;──────────────────────────────────────────────────►◄
```

The **ENDSUBPAGE** command is used to identify the end of a subpage for conditional processing.

You can specify the **ENDSUBPAGE** command at any point in a page definition command stream where a **PRINTLINE** or **LAYOUT** command can occur. However, you must not enter the **ENDSUBPAGE** command between a **PRINTLINE** or **LAYOUT** command and its associated **FIELD** or **CONDITION** command.

If an **ENDSUBPAGE** command is not specified, the entire page format is treated as one subpage.

EXTREF Command

The **EXTREF** command specifies resources that are to be mapped in the page. It is a way in PPFA to map objects that wouldn't otherwise be mapped. If an object contains another mapped object, the contained object must be mapped, but PPFA will not automatically map that object.

For example if you presented a GOCA object that contained a mapped font, CMR, and/or another object, those resources will not be mapped in the page. The **EXTREF** command can be used to map this required resource.

Note: Even though a font is mapped automatically by PPFA when it is used internally in the page definition on a **PRINTLINE**, **LAYOUT**, **XLAYOUT**, or **FIELD** command, a font that is used in an included object, such as a GOCA object, is not known to PPFA and consequently not mapped. In that case the user must **define that font with either a FONT or DOFONT command and map it with the EXTREF command**.

EXTREF Command

```
                ┌─FONT─┐
►►──EXTREF──────┼──────┴─lname───────────────────────────────────────────────────────┬─;───►◄
                ├─OB2CMR──lname──┬─AUDIT─┬───────────────────────────────────────────┤
                │                ├─INSTR─┤                                           │
                │                └─LINK──┘                                           │
                └─OB2R──┬──────────┬─OB2XNAME──┬─x2name──────┬─OB2ID──┬─n──────────┬─┘
                        ├─i2name───┤           ├─'x2name'────┤        └─type-name──┘
                        ├─'i2name'─┤           ├─C'x2name'───┤
                        ├─C'i2name'┤           ├─E'x2name'───┤
                        ├─E'i2name'┤           ├─A'x2name'───┤
                        ├─A'i2name'┤           ├─X'hhhh'─────┤
                        └─X'i2name'┘           ├─U8'x2name'──┤
                                               ├─U16'x2name'─┤
                                               ├─x8'hhhh'────┤
                                               └─x16'hhhh'───┘
```

The **EXTREF** command allows you to map resources used in included objects that are not known to PPFA and therefore not mapped.

Subcommands

FONT

Specify a font to be mapped. This parameter is the default if **FONT**, **OB2CMR**, or **OB2R** are not specified.

lname

Local name for a font. Specifies an unquoted alphanumeric name of 1 to 16 characters that is to be used in this page definition. The name must be unique within this page definition. *lname* is the name used in the **FONT** or **DOFONT** commands which define the font.

OB2CMR

```
├──OB2CMR──lname──┬─AUDIT─┬───────────────────────────────────────────┤
                  ├─INSTR─┤
                  └─LINK──┘
```

Note: See Chapter 8, “AFP Color Management,” on page 173 for more information about using the CMR subcommand.

Specify a Color management resource (CMR) and its process mode for a data object specified within an included object. CMRs are secondary objects when used at this level. An object specified here will be mapped with "object" scope.

cmr-lname

The CMR local name. This name must have been defined with a **DEFINE CMR** command.

processing-mode-parameter

Specify the processing mode for the CMR.

AUDIT

CMRs with the audit processing mode refer to processing that has already been applied to a resource. In most cases, audit CMRs describe input data and are similar to ICC input profiles.

The audit processing mode is used primarily with color conversion CMRs. In audit processing mode, those CMRs indicate which ICC profile must be applied to convert the data into the Profile Connection Space (PCS).

INSTR

CMRs with the instruction processing mode refer to processing that is done to prepare the resource for a specific printer using a certain paper or another device. Generally, instruction CMRs refer to output data and are similar to ICC output profiles.

The instruction processing mode is used with color conversion, tone transfer curve, and halftone CMRs. In instruction processing mode, these CMRs indicate how the system must convert a resource so it prints correctly on the target printer. The manufacturer of your printer should provide ICC profiles or a variety of CMRs that you can use. Those ICC profiles and CMRs might be installed in the printer controller, included with the printer on a CD, or available for download from the manufacturer's Web site.

LINK

This CMR defines a direct color conversion from an input color space to a device output color space; process the **CMR** as a link CMR. This processing mode is only valid for device link (DL) CMRs. The PPFA command RENDER is not used with device link (DL) CMRs as such CMRs specify the intended rendering intent internally. This function requires print server (PSF) and printer support which is in addition to the original CMR support.

OB2R

```
├──OB2R──┬─────────────┬──OB2XNAME──┬─x2name──────┬──────────────┤
         ├─i2name──────┤            ├─'x2name'────┤
         ├─'i2name'────┤            ├─C'x2name'───┤
         ├─C'i2name'───┤            ├─E'x2name'───┤
         ├─E'i2name'───┤            ├─A'x2name'───┤
         ├─A'i2name'───┤            ├─X'hhhh'─────┤
         └─X'hhhh'─────┘            ├─U8'x2name'──┤
                                    ├─U16'x2name'─┤
                                    ├─x8'hhhh'────┤
                                    └─x16'hhhh'───┘
```

Specify a secondary object to be mapped.

If an included object contains a reference to one or more secondary objects, you must identify them at this point. Specify the internal name for the secondary resource as specified in the included resource. If the internal name contains special characters such as periods or blanks, then quotes must surround the name.

i2name
Unquoted name up to 250 characters long will be folded to upper case and translated into EBCDIC if necessary.

'i2name'
Quoted name up to 250 characters long will be accepted as-is with no case folding or translation.

C'i2name'
Quoted name with a “C” for Character will be treated the same as a quoted name of up to 250 characters. No folding or translation will be done.

E'i2name'
Quoted name with an “E” for EBCDIC entered with up to 250 characters will be accepted as-is if on an EBCDIC platform or translated to EBCDIC if on an ASCII platform. The translation will be made with no case folding.

A'i2name'
Quoted name with an “A” for ASCII entered with up to 250 single-byte characters will be accepted as-is if on an ASCII platform or translated to ASCII if on an EBCDIC platform. The translation will be made with no case folding.

X'hhhh'
Quoted name with an “X” for Hexadecimal entered with up to 500 hexadecimal characters. The characters will be translated to hexadecimal, but no assumptions of data type will be made.

OB2XNAME *x2name*
Specifies the external name for a secondary resource object. The name can be up to 250 characters. If the name contains special characters or blanks, then quotes must surround the name.

x2name
Unquoted name up to 250 characters long will be folded to upper case and translated into EBCDIC if necssary.

'x2name'
Quoted name up to 250 characters long will be accepted as-is with no case folding or translation.

C'x2name'
: Quoted name with an “C” for Character will be treated the same as a quoted name up to 250 characters. No folding or translation is done.

E'x2name'
: Quoted name with an “E” for EBCDIC entered with up to 250 single-byte characters will be accepted as-is if on an EBCDIC platform or translated to EBCDIC if on an ASCII platform. The translation will be made with no case folding.

A'x2name'
: Quoted name with an “A” for ASCII entered with up to 250 single-byte characters will be accepted as-is on an ASCII platform or translated to ASCII if on an EBCDIC platform. The translation will be made with no case folding.

X'hhhh'
: Quoted name with an “X” for Hexadecimal entered with up to 500 hexadecimal characters. The characters will be translated to hexadecimal, but no assumption of data type will be made.

U8'x2name'
: Quoted name with a “U8” for UTF-8 entered with up to 250 single-byte characters will be translated to UTF-8.

X8'hhhh'
: Quoted name with an “X8” for UTF-8 HEX entered with up to 500 single-byte hexadecimal characters will be translated to hexadecimal and assumed to be data type UTF-8. There must be a multiple of 2 hexadecimal characters entered.

U16'x2name'
: Quoted name with a “U16” for UTF-16 entered with up to 125 single-byte characters will be translated to UTF-16.

X16'hhhh'
: Quoted name with an “X16” for UTF-16 HEX entered with up to 500 single-byte hexadecimal characters will be translated to hexadecimal and assumed to be data type UTF-16. There must be a multiple of 4 hexadecimal characters entered.

OB2ID *n* | *type-name*

```
├──OB2ID──┬─n─────────┬──────────────────────────────────────────┤
          └─type-name─┘
```

Component type identifier for secondary resource' use an object type number as specified in Object type list adjustments. Use an object type number from the “Component-id” column or a type name from the “Type name ” of the following table:

Table 11. Object Types that can be referenced as Secondary Resources

Type-Name	Component-id	Description of OID Type-Name
PDFRO	26	PDF Resource Object (new)
RESCLRPRO	46	Resident Color Profile Resource Object
IOCAFS45RO	47	IOCA FS45 Resource Object Tile (new)

Example:

In the example below, the fonts “ocaf”, “fontA”, and “fontABI” and the CMR “rtvc” are mapped in the Object Environment Group (OEG) of an object that is being included in the page.

Without the **EXTREF** commands, only the font “varb” would be mapped because only it is being called out in the PPFA source code. Also, without the **EXTREF** command, the CMR “rvtc” will not be mapped.

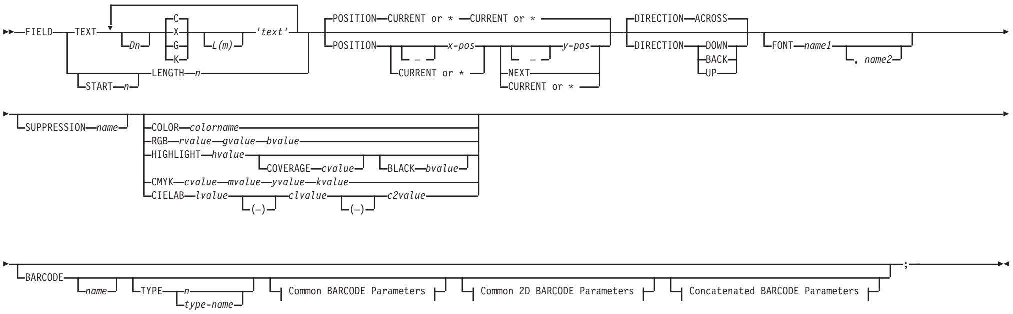
Notes:

1. The **fonts** coded in the **EXTREF** commands must also be defined in a FONT command.
2. If we code “rtvc” with a CMR command (as in the commented out CMR command) it will be mapped but will be active for the entire page and we only want it to be active for the object in whose OEG it is mapped.

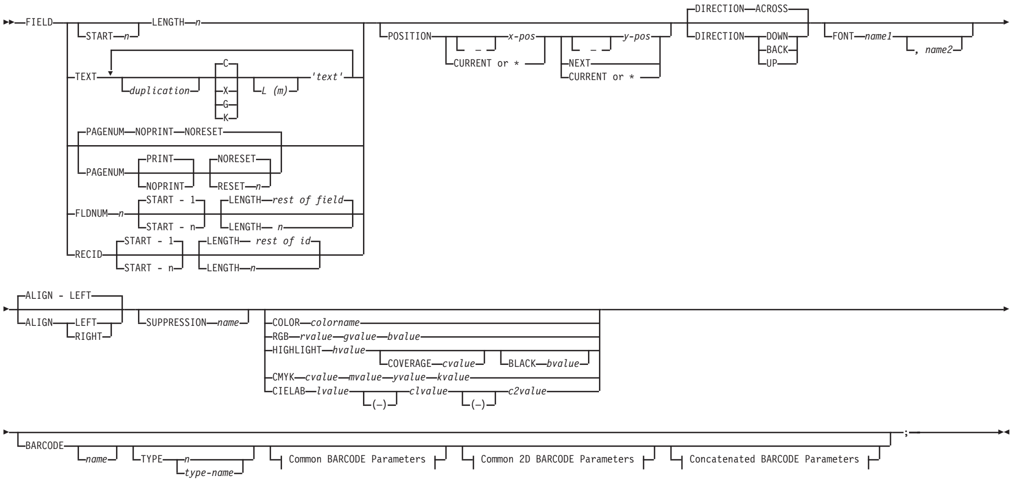
```
PAGEDEF cmr42   replace yes;
     FONT  varb  gt10   ;           /*Variable data          */
     FONT  ocaf CS N40090 CP 000395; /* mapped in OEG        */
     DOFONT fontA 'Arial'  Height 12;
     DOFONT fontABI 'Arial Bold Italic'
            UDTYPE EBCDIC CP 'T1V10500';

     DEFINE rvtc CMRNAME
  'RevVideoTC001.000@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@'
       '@@@@@@'

     SETUNITS  LINESP .25 in ;      /* Line spacing          */

     PAGEFORMAT  rept1   TOPMARGIN .25 in;
       EXTREF ocaf;
       EXTREF fontA;
       EXTREF fontABI;
       EXTREF OB2CMR rvtc instr;

   /*  CMR rvtc  instr;     **/
       LAYOUT 'startline' BODY  newpage POSITION .5 in SAME FONT varb;
       LAYOUT 'plaindata' BODY          POSITION .5 in NEXT FONT varb;
```

FIELD Command

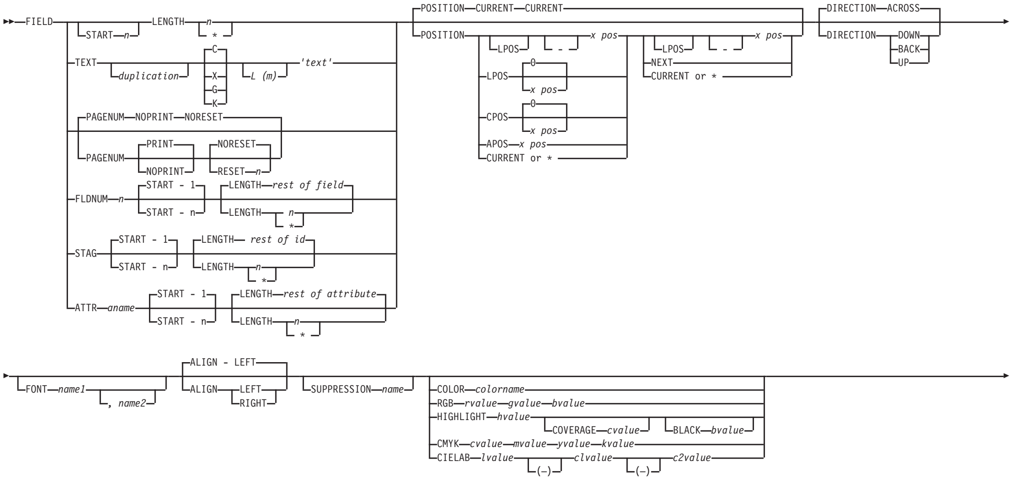
FIELD Command (Traditional only)

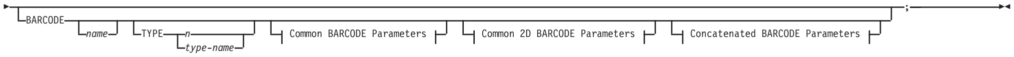


FIELD Command (Record Format)

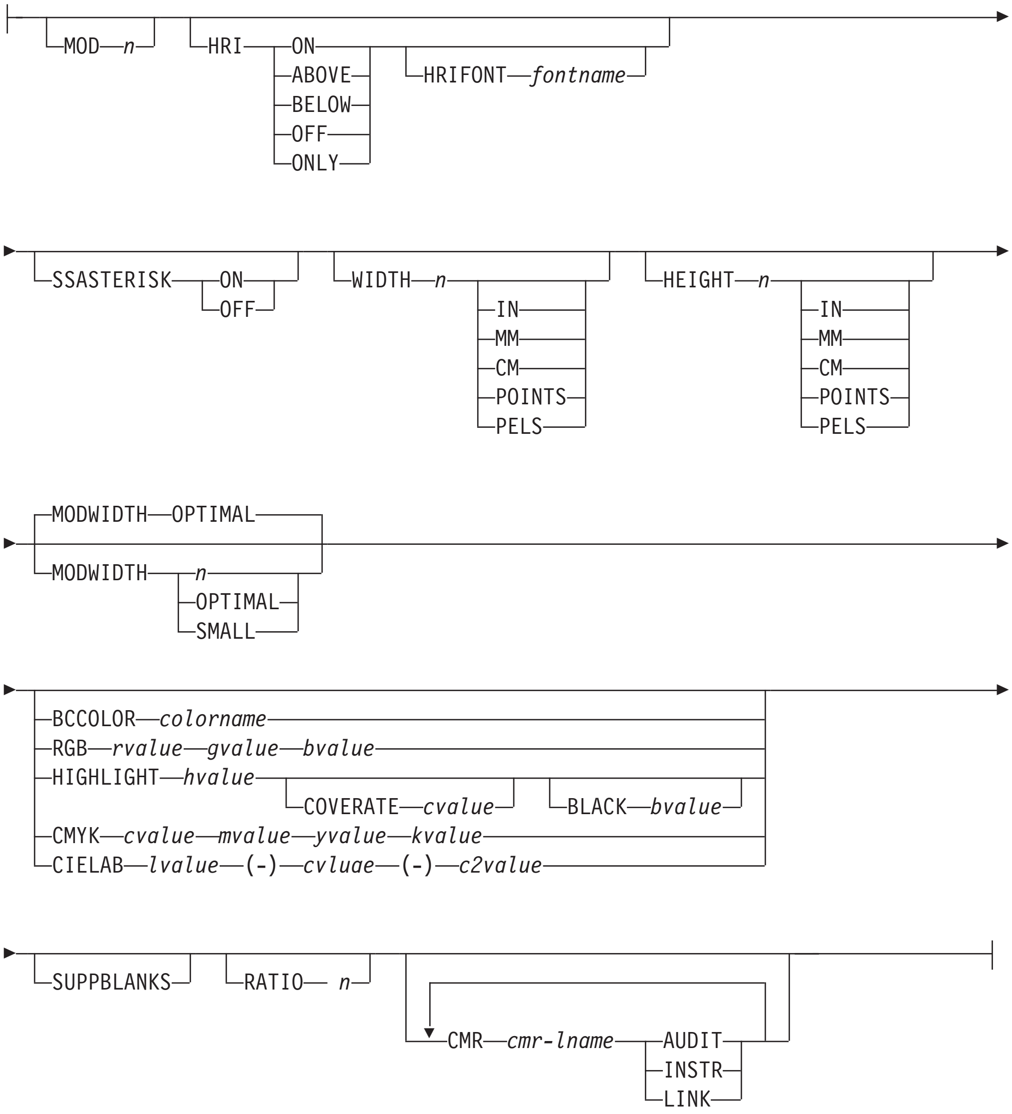


FIELD Command (XML)

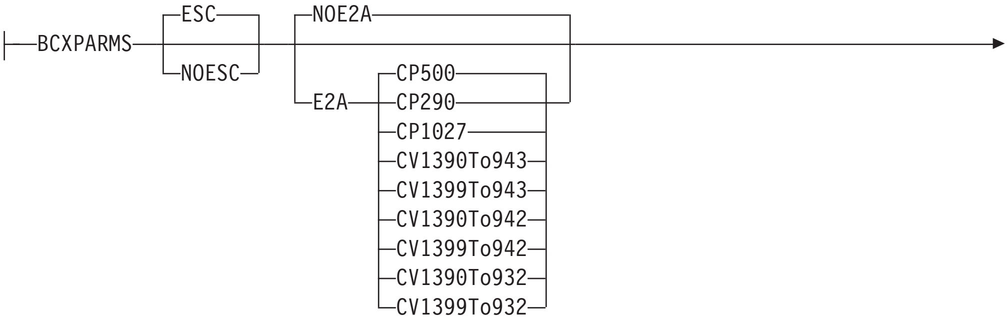




Common BARCODE Parameters:



Common 2D BARCODE Parameters:



FIELD Command

```
►─┬─────────────────────────────────┬──────────────────────────────────────┤
  ├─┤ Data Matrix 2D Parameters ├───┤
  ├─┤ MaxiCode 2D Parameters ├──────┤
  ├─┤ PDF417 2D Parameters ├────────┤
  └─┤ QRCODE 2D Parameters ├────────┘
```

Concatenated BARCODE Parameters:

```
├──BCDSYMB──┬─symname────────┬──────────────────────────────────────────────┤
            ├─BCDSEQ──seq#───┤
            └─BCDNEW─────────┘
```

Data Matrix 2D Parameters:

```
   ┌─unspecified──────────────┐
├──┼──────────────────────────┼─────────────────────────────────────────────►
   └─SIZE──rows──┬────┬──cols─┘
                 └─BY─┘

                                                               ┌─USERDEF──────┐
►──┬──────────────────────────────────────────────────────┬───┼──────────────┼─┤
   │                                ┌─ID──1──1─────────┐  │   ├─FNC1UCC──────┤
   └─SEQUENCE──seq──┬────┬──tot─────┼──────────────────┼──┘   ├─FN1IND───────┤
                    └─OF─┘          └─ID──uidHi──uidLo─┘      ├─RDRPROG──────┤
                                                              ├─MAC5─────────┤
                                                              ├─MAC6─────────┤
                                                              └─ENCODE──type─┘
```

MaxiCode 2D Parameters:

```
   ┌─MODE 4──┐                                         ┌─NOZIPPER─┐
├──┼─────────┼──┬──────────────────────────────────┬──┼──────────┼──────────┤
   └─MODE md─┘  └─SEQUENCE──seq──┬────┬──tot───────┘  └─ZIPPER───┘
                                 └─OF─┘
```

PDF417 2D Parameters:

```
   ┌─SIZE──MIN──10───────────────────────────────────┐  ┌─SECLEV──0──┐
├──┼─────────────────────────────────────────────────┼──┼────────────┼─────►
   └─SIZE──┬─MIN──────────┬──┬────┬──cols (1-30)─────┘  └─SECLEV──sl─┘
           └─rows (3-80)──┘  └─BY─┘

►──┬────────────────────┬──────────────────────────────────────────────────┤
   └─MACRO──qstring─────┘
```

QRCODE 2D Parameters:

```
   ┌─SIZE──MIN─────────┐
├──┼───────────────────┼──┬───────────────────────────────────────────────────┬──►
   └─SIZE──┬─────────┬─┘  └─SEQUENCE──seq──┬────┬──tot──┬─────────────────────┬┘
           ├─rows────┤                     └─OF─┘       └─PARITY──X'dd'───────┘
           └─MIN─────┘
```

```
   ┌─ECLEV──L──────┐   ┌─USERDEF──────────────┐
►──┤               ├───┤                      ├──────────────────────────────────────────┤
   └─ECLEV──┬─M─┬──┘   ├─FNC1UCC──────────────┤
            ├─Q─┤      └─FNC1IND──AI──'ai'────┘
            └─H─┘
```

The **FIELD** command identifies a field in a data record or supplies a field of constant text, and positions where the field is on the page. More than one position on the page can be specified.

FIELD commands:
- Are subordinate to a **PRINTLINE** command (Traditional), **LAYOUT** command (Record Format), or **LAYOUT** subcommand (XML)
- Must follow a **PRINTLINE** command (Traditional) or a **LAYOUT** command (Record Format)
- Must contain either a **LENGTH** subcommand or a **TEXT** subcommand (Traditional only)

The **FONT**, **DIRECTION**, and **COLOR** subcommands do not have fixed defaults. If any of these subcommands is omitted, the value for the omitted subcommand is obtained from corresponding subcommand in the **PRINTLINE** command (Traditional), **LAYOUT** command (Record Format), or **LAYOUT** subcommand (XML).

Subcommands

START

```
├──┬───────────┬──LENGTH──n──────────────────────────────────────────────────────┤
   └─START──n──┘
```

Specifies the starting byte in the data record for the desired field.

n Specifies the number of bytes from the first data byte in the record to be used as the starting point of the field. The first data byte position of an input record is 1.

Note: The carriage-control character, table-reference character, and record ID are not considered data.

***** Denotes the next byte after the field identified in the previous **FIELD** command, excluding **FIELD** commands with constant **TEXT**.

+ *n* Adds the value of n to the * byte position.

– *n* Subtracts the value of n from the * byte position.

If **START** is omitted and **LENGTH** is specified, then **START** * is assumed.

LENGTH *n* Specifies the number (*n*) of bytes to process from the data record, beginning with the position specified in **START**.

Record Format: Once the maximum length of the field has been determined, the print server truncates all of the fields not containing data.

TEXT

```
           ┌─────────────────────────────────────┐
           ▼               ┌─C─┐                  │
├──TEXT──┬───────┬─────────┼─X─┼──┬────────┬─'text'─┴──────────────────────────────────────┤
         └──Dn───┘         ├─G─┤  └──L(m)──┘
                           └─K─┘
```

Specifies the constant text that is to be printed in the output. A maximum of 65,535 bytes of text can be provided in one page format.

Note: This text is considered constant in that the same text is printed each time. In reference to the **CONSTANT** command within a form definition, this text is considered variable because the text prints only where variable data is allowed to print.

duplication=D*n*
Specifies the number of times the text is to be repeated (use a decimal number). The maximum times the text is repeated varies depending on the size of the text. The default is **1**.

texttype = {C | X | G | K }
Specifies the type of text.

C Indicates that the text contains single-byte code characters, which includes all Roman alphabetic characters (for example, those used for English). Any valid character code can be specified, including blanks. This is the default.

X Indicates that the text contains hexadecimal codes (in groups of two hexadecimal codes) that specify values from X'00' through X'FE'.

G Indicates that the text contains double-byte code characters (for example, kanji characters).

Characters in type **G** text must start with shift-out (SO X'0E') and end with shift-in (SI X'0F') characters within opening and closing apostrophes (X'7D' for EBCDIC platforms and X'27' for ASCII platforms) .

K Indicates that the text contains kanji numbers enclosed in apostrophes. Kanji numbers are separated by commas:

```
K'321,400'
```

Valid double-byte character set (DBCS) codes are from X'41' through X'FE' for each byte. Code X'4040' (blank) is the only exception.

Valid	X'4040', X'4141', X'41FE' X'FE41', X'FEFE'
Invalid	X'2040', X'413E', X'4100' X'7F00', X'FE3E'

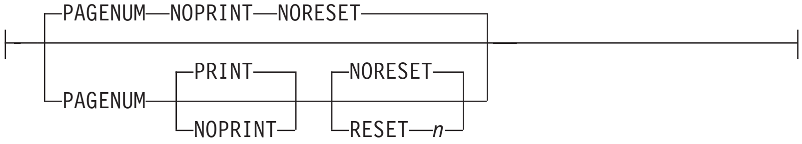
L(*m*) Specifies the length of text (use a decimal number in parentheses). When the actual length of the text is different from *m*, the *m* specification is honored. That is, the text is either padded with blanks to the right or truncated.

'*text***'** Specifies the text.

Examples:

- When TEXT 2C(3)‘AB’ is specified, ‘AB AB ’ is generated. The blanks are generated because of the (3) specification.
- TEXT 2C(1)‘AB’ generates ‘AA’, truncating the Bs.

PAGENUM *n* (Record Format and XML)



Although parameters are specified as optional, at least one must be specified.

Page numbers could be set at this point to start with the value specified as *n*, otherwise they follow the specification made in the **PAGEDEF** or **PAGEFORMAT** command.

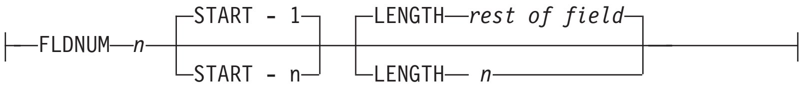
The **POSITION** parameters specified with the **PAGENUM** parameter reflects the position of the page number only.

If you do not wish a page number printed, either do not use this parameter or specify **NOPRINT**.

The **RESET** parameter is only used when you wish to reset the page number that is to be used with this page.

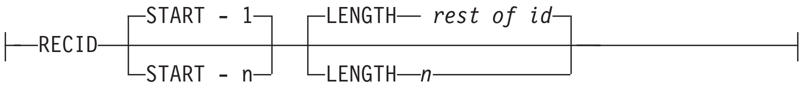
Note: You should define a font that specifies the font type to be used for printing page numbers.

FLDNUM (Record Format and XML)



This keyword should only be used if the **DELIMITER** field was used in the **LAYOUT** command. Fields cannot be counted without delimiters being specified in the database.
To allow for the identification of a part of a field which is field delimited, you can specify the starting position (from the delimiter), and optionally the length of the part of the field you want to use. The **LENGTH** default is to use the entire remainder of the field from the start position to the ending delimiter.

RECID (Record Format only)



This keyword allows you to access characters in the first *n*

characters of a record. This area is reserved for the record identifier, and all other field starts and lengths are calculated after this area. These starts and lengths reference only the area within the record ID.
If no record length is specified, the remaining bytes of the *n*–byte field is assumed.

STAG (XML only)

```
         ┌─START - 1─┐ ┌─LENGTH── rest of id─┐
►►──STAG─┴─START - n─┴─┴─LENGTH──┬─n─┬───────┴───────────────►◄
                                 └─*─┘
```

This keyword allows you to access characters in the the **START** tag. It also includes the “<” “>” delimiters, so that position 1 is always the “<” delimiter.
If no record length is specified, the remaining bytes of the **START** tag is assumed. If no **START** is specified, 1 is assumed.

LENGTH * means using the remainder of the field for the length.

ATTR (XML only)

```
                 ┌─START - 1─┐ ┌─LENGTH──rest of attribute─┐
►►──ATTR──aname──┴─START - n─┴─┴─LENGTH──┬─n─┬───────────┴─────►◄
                                         └─*─┘
```

This keyword allows you to access attribute values from the data. Multiple attribute fields can access the same attribute allowing subsets of the value to be printed.

If no record length is specified, the remaining bytes of the attribute are assumed. If not **START** is specified, 1 is assumed.

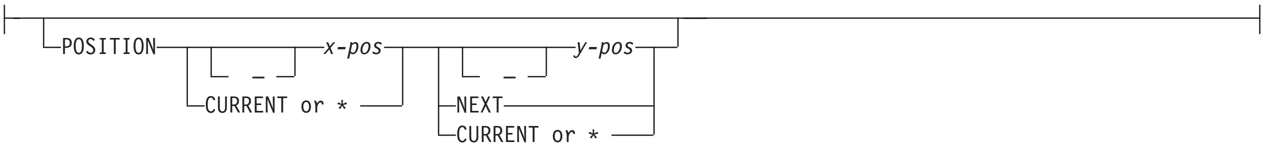
aname	The attribute name. To preserve the case, enter the name in quotes. The name is converted to the data type you specify, using **UDTYPE** on the page definition, or it is defaulted.
START *n*	The starting position of the attribute to extract the data. If this parameter is omitted, position 1 is assumed.
LENGTH *n*	The length of the attribute to be placed. If this parameter is omitted or **LENGTH *** is coded, the rest of the field is assumed for the length.

POSITION

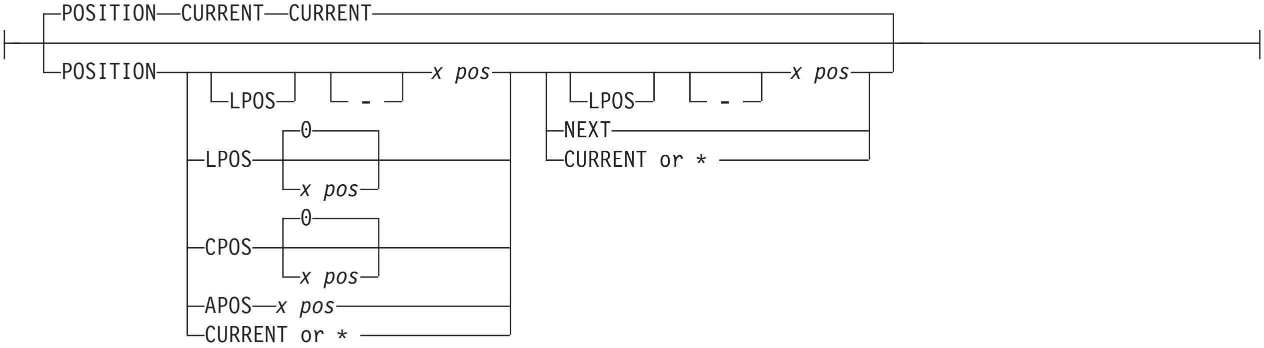
Traditional:

```
  ┌─POSITION──CURRENT or * ──CURRENT or * ──────────┐
├─┴─POSITION──┬─┬───┬─x-pos─┬──┬─┬───┬─y-pos─┬─────┴──────────────────────────────────────┤
              │ └─-─┘       │  │ └─-─┘       │
              └─CURRENT or *┘  ├─NEXT────────┤
                               └─CURRENT or *┘
```

Record Format:



XML:



Specifies the starting position of the field in the printout.

x-pos	Do not mix *x-pos* specifications with **CURRENT** or * except in **ACROSS** fields.

–	Specifies that the *x* value is negative.
x	Specifies the horizontal offset for the starting print position relative to the *printline starting position*. The choices are **IN**, **MM**, **CM**, **POINTS**, or **PELS**. The default is the most recent **SETUNITS** command value or **IN** (inch) if a **SETUNITS** command has not been issued. The **PELS** measurement equals one L-unit or 1/240 of an inch, depending on whether the **PELSPERINCH** parameter had been specified previously.
APOS	Specifies that the *x pos* parameter that follows is absolute. The *x pos* parameter is mandatory and must be positive.
CPOS	Specifies that the *x pos* parameter that follows is relative to the current position. This parameter can be negative.
LPOS	Specifies that the *x pos* parameter that follows is relative to the **XLAYOUT** position. This parameter can be negative.
CURRENT	Specifies that the inline offset (relative to the field's direction) is the end of the previous field. For the first field, use the **PRINTLINE** offset. This is the default.

Note: The meaning of **CURRENT** differs from the meaning of the **PRINTLINE** command parameter (Traditional) or a **LAYOUT** command parameter (Record Format) **SAME**.

* Alternate for **CURRENT**.

y-pos Do not mix *y-pos* specifications with **CURRENT** or * except in **ACROSS** fields.

– Specifies that the *y* value is negative.

y Specifies the vertical offset for the starting print position relative to the *printline starting position*. The choices are **IN**, **MM**, **CM**, **POINTS**, or **PELS**.

The default is the most recent **SETUNITS** command value or **IN** (inch) if a **SETUNITS** command has not been issued.

NEXT Specifies a field that is positioned down one line in the baseline direction (as defined in the **SETUNITS** command **LINESP** subcommand) from the previous field.

Use **NEXT** only in **ACROSS** fields.

CURRENT Specifies that the baseline offset (relative to the field's direction) is the same as the previous field. That is, the baseline position does not change. For the first field, use the **PRINTLINE** (Traditional) or a **LAYOUT** (Record Format) offset. This is the default.

* Alternate for **CURRENT**.

FONT

```
├──┬──────────────────────────┬──────────────────────────────────────────────┤
   └─FONT──name1──┬──────────┬┘
                  └─, name2──┘
```

Defines the font to be used for the field.

name1 Specifies the local name of a font used to print the data. This font must have been defined in a previous **FONT** or **DOFONT** command in this page definition.

If Shift-Out, Shift-In (SOSI) processing is used, *name1* must be the single-byte font.

name2 Specify only when using Shift-Out, Shift-In (SOSI) processing to dynamically switch between a single-byte font and a double-byte font within the field. *name2* must be the double-byte font.

Note: *name2* is only valid with EBCDIC data.

Notes:

1. If this subcommand is not specified, the font specified in the preceding **PRINTLINE** command (Traditional) or a **LAYOUT** command (Record Format) is used. If neither has been specified, the print server assigns a font.]
2. **Record Format only:** For **ASCII**, **UTF8**, or **UTF16** the entire **PRINTLINE** command must be one font. To use multiple font mappings for a line in **ASCII**, **UTF8**, or **UTF16** you must use the **FIELD** command.

ALIGN LEFT | RIGHT (Record Format and XML only)

The data in this field is left or right aligned to the x position specified in the horizontal **POSITION** parameter.

DIRECTION

Specifies the print direction of the field, relative to the upper-left corner as you view the logical page. If this subcommand is omitted, the direction specified in the governing **PRINTLINE** command is used.

ACROSS	The page is printed with the characters added from *left to right* on the page, and the lines are added from the top to the bottom.
DOWN	The page is printed with the characters added from *top to bottom* on the page, and the lines added are from the right to the left.
BACK	The page is printed with the characters added from *right to left* on the page, and the lines are added from the bottom to the top.
UP	The page is printed with the characters added from *bottom to top* on the page, and the lines are added from the left to the right.

Note: Not all printers can print in all directions. Refer to your printer documentation for more information.

If **DIRECTION** is not zero then the position is relative to the rotated origin of the page.

SUPPRESSION

Specifies that this text field can be suppressed (not valid for barcodes).

name Specifies the name of a field to be suppressed.

Printing of this field is suppressed if this name is identified by a **SUPPRESSION** command within the form definition.

The same name can be used in one or more fields to suppress these fields as a group.

COLOR

```
├──┬─COLOR──colorname────────────────────────────────────────┬──────┤
   ├─RGB──rvalue──gvalue──bvalue─────────────────────────────┤
   ├─HIGHLIGHT──hvalue──┬───────────────────┬──┬─────────────┬┤
   │                    └─COVERAGE──cvalue─┘  └─BLACK──bvalue─┘│
   ├─CMYK──cvalue──mvalue──yvalue──kvalue────────────────────┤
   └─CIELAB──lvalue──┬─────┬─clvalue──┬─────┬─c2value────────┘
                     └─(−)─┘          └─(−)─┘
```

Specifies an **OCA** or defined color for the text of this field. This subcommand is recognized only by printers that support multiple-color printing. Refer to your printer publication for more information.

colorname Values for *colorname* can be a defined color (see "DEFINE COLOR Command" on page 313), or an OCA *colorname*. Values for OCA *colornames* are:

- **BLUE**
- **RED**
- **MAGENTA** (or **PINK**)
- **GREEN**
- **CYAN** (or **TURQ**)
- **YELLOW**
- **BLACK**
- **BROWN**
- **MUSTARD**
- **DARKBLUE** (or **DBLUE**)
- **DARKGREEN** (or **DGREEN**)
- **DARKTURQ** (**DTURQ**, or **DCYAN**, or **DARKCYAN**)
- **ORANGE**
- **PURPLE**
- **GRAY**
- **NONE**
- **DEFAULT**

The color choices depend on the printer.

Note: In some printer publications, the color turquoise (**TURQ**) is called "cyan", and the color pink (**PINK**) is called "magenta".

Color Model Specifies the color of print for this field supported in MO:DCA for the Red/Green/Blue color model (**RGB**), the highlight color space, the Cyan/Magenta/Yellow/Black color model (**CMYK**), and the **CIELAB** color model.

```
 FIELD START 1 LENGTH 5
               COLOR BLUE ;
FIELD START 1  LENGTH 1
               RGB 10  75  30 ;
FIELD START 1  LENGTH 1
               cmyk 80 10 10 10 ;
FIELD START 1  LENGTH 2
               CIELAB 80 100 20 ;
FIELD START 1  LENGTH 2
               highlight 5 ;
FIELD START 1  LENGTH 2
               highlight 300 COVERAGE 50 BLACK 30 ;
```

Figure 113. Color Model Using the **FIELD** *Command*

RGB *rvalue gvalue bvalue*

```
├──┬─────────────────────────────┬──────────────────────────────────────┤
   └─RGB──rvalue──gvalue──bvalue─┘
```

Three **RGB** integer values are used. The first (*rvalue*) represents a value for red, the second (*gvalue*) represents a value for green, and the third (*bvalue*) represents a value for blue. Each of the three integer values may be specified as a percentage from 0 to 100.

Note: An **RGB** specification of 0/0/0 is black. An **RGB** specification of 100/100/100 is white. Any other value is a color somewhere between black and white, depending on the output device.

HIGHLIGHT *hvalue* **COVERAGE** *cvalue* **BLACK** *bvalue*

```
├──┬───────────────────────────────────────────────────────────┬────────┤
   └─HIGHLIGHT──hvalue──┬─────────────────┬──┬──────────────┬──┘
                        └─COVERAGE──cvalue─┘  └─BLACK──bvalue─┘
```

Indicates the highlight color model. Highlight colors are device dependent.

You can use an integer within the range of 0 to 65535 for the *hvalue*.

Note: An *hvalue* of 0 indicates that there is no default value defined; therefore, the default color of the presentation device is used.

COVERAGE indicates the amount of coverage of the highlight color to be used. You can use an integer within the range of 0 to 100 for the *cvalue*. If less than 100 percent is specified, the remaining coverage is achieved with the color of the medium.

Note: Fractional values are ignored. If **COVERAGE** is not specified, a value of 100 is used as a default.

BLACK indicates the percentage of black to be added to the highlight color. You can use an integer within the range of 0 to 100 for the *bvalue*. The amount of black shading applied depends on the **COVERAGE** percentage, which is applied first. If less than 100 percent is specified, the remaining coverage is achieved with black.

Note: If **BLACK** is not specified, a value of 0 is used as a default.

CMYK *cvalue mvalue yvalue kvalue*

```
├──┬─────────────────────────────────────┬──────────────────────────────────────────────────────────┤
   └─CMYK──cvalue──mvalue──yvalue──kvalue─┘
```

Defines the cyan/magenta/yellow/black color model. *Cvalue* specifies the cyan value. *Mvalue* specifies the magenta value. *Yvalue* specifies the yellow value. *Kvalue* specifies the black value. You can use an integer percentage within the range of 0 to 100 for any of the **CMYK** values.

CIELAB *Lvalue* **(–)***c1value* **(–)***c2value*

```
├──┬────────────────────────────────────────────────────────────┬─────────────────────────────────┤
   └─CIELAB──lvalue──┬─────┬─clvalue──┬─────┬─c2value─┘
                     └─(–)─┘          └─(–)─┘
```

Defines the **CIELAB** model. Use a range of 0.00 to 100.00 with *Lvalue* to specify the luminance value. Use signed integers from −127 to 127 with *c1value* and *c2value* to specify the chrominance differences.
Lvalue, *c1value*, *c2value* must be specified in this order. There are no defaults for the subvalues.

Note: Do not specify both an **OCA** color with the **COLOR** sub-parameter and an extended color model on the same **FIELD** or **PRINTLINE** command. The output is device dependent and may not be what you expect.

BARCODE

```
├──┬─────────────────────────────────────────────────────────────────────────────────────────────┬──────┤
   └─BARCODE──┬──────┬──┬──────────────────────┬──┤ BARCODE Parameters ├──┤ 2D BARCODE Parameters ├─┘
              └─name─┘  └─TYPE──┬─n─────────┬──┘
                                └─type-name─┘
```

Specifies a bar code in a page definition. The following are valid barcode type-names:

- **CODE39** (same as 1)
- **MSI** (same as 2)
- **UPCA** (same as 3)
- **UPCE** (same as 5)
- **UPC2SUPP** (same as 6)
- **UPC5SUPP** (same as 7)
- **EAN8** (same as 8)
- **EAN13** (same as 9)
- **IND20F5** (same as 10)
- **MAT20F5** (same as 11)
- **ITL20F5** (same as 12)
- **CDB20F7** (same as 13)
- **CODE128** (same as 17)
- **EAN2SUP** (same as 22)
- **EAN5SUP** (same as 23)
- **POSTNET** (same as 24)
- **RM4SCC** (same as 26)
- **JPOSTAL** (same as 27)
- **2DMATRIX** (same as 28)
- **2DMAXI** (same as 29)
- **2DPDF417** (same as 30)
- **APOSTAL** (same as 31)
- **2DQRCODE** (same as 32)
- **CODE93** (same as 33)
- **US4STATE** (same as 34)
- **REDTAG** (same as 35)
- **DATABAR** (same as 36)

The bar code name can be 1-8 characters long. Refer to your printer documentation for additional information about bar code support. Ensure that the bar code fits on the page or you will get errors at print time.

Please read your printer hardware documentation before using bar codes. The documentation indicates which bar code types, modifiers, **MODWIDTH**, element heights, and ratio values are valid for the printer.

PPFA does minimal verification of the bar code values. If you use the **MOD**, **HEIGHT**, **MODWIDTH**, and **RATIO** parameters, ensure that the values you specify are valid for your printer.

For printer optimization, specify **BARCODE** *name options* in the first instance of a specific type of bar code. If this type is used again, position it as usual with **START**, **LENGTH**, and **POSITION**, but specify the barcode information using only **BARCODE** *same-name-as-previously*. The **BARCODE** subcommand is recognized only by printers that support BCOCA bar code printing; refer to your printer documentation for more information.

Bar code concatenation

The concatenated bar code function allows the user to collect bar code data from different fields and/or records to be concatenated in generating a bar code object.

For example, the hyphen in a nine-digit ZIP code, *aaaaa-bbbb*, is not a valid character in a **POSTNET** bar code. The concatenated bar code function will allow a user to specify a **FIELD** for the *aaaaa* and a **FIELD** for the *bbbb* and concatenate them together into one bar code. In the case of **2D** bar codes, which can contain many bytes of data, multiple records of data can be concatenated together into one bar code.

The defining bar code fully defines a bar code, specifying any necessary placement or descriptive parameters. A defining bar code can start the collection of bar code data if it specifies a **BARCODE** name and the **BCDSYMB** keyword with a symbol name.

The continuation bar code defines bar code data that is to be added to a bar code data collection started with a defining bar code with **BCDSYMB** coded. This bar code uses the defining **BARCODE** name and **BCDSYMB** name but does not have the **TYPE** or **BARCODE** Parameters specified because it uses the information from the defining bar code.

Bar code Concatenation Example 1 : POSTNET 9 digit barcode split in 2 fields *aaaaa-bbbb*

```
PAGEDEF BC1P  REPLACE YES;
  FONT afont GT10;
  PAGEFORMAT example1;
    PRINTLINE POSITION 4 in 1.5 in;
      FIELD START   1 LENGTH   15 POSITION 0 IN 0 IN;
      FIELD START  16 LENGTH   20 POSITION 0 IN NEXT;
      FIELD START  36 LENGTH   15 POSITION 0 IN NEXT;

      FIELD START  51 LENGTH    5 POSITION 0 IN 0.70 IN
            BARCODE zip54 TYPE POSTNET MOD 1 BCDSYMB datacoll;
      FIELD START  57 LENGTH    4 BARCODE zip54 BCDSYMB datacoll;
```

Bar code Concatenation Example 2 : 2D barcode with data bytes across multiple records

```
PAGEDEF BC2P  REPLACE YES;
  FONT afont GT10;
  PAGEFORMAT example2;
    PRINTLINE POSITION 1 in 1  in;
      FIELD START   1 LENGTH  200
        POSITION 1.0 IN 1.0 IN DIRECTION ACROSS
        BARCODE maxil TYPE 2DMATRIX MOD 0 BCXPARMS ESC E2A
        BCDSYMB bcd2 BCDSEQ  5;

    PRINTLINE REPEAT 4;
      FIELD START   1 LENGTH  200 DIRECTION ACROSS
        BARCODE maxil BCDSYMB bcd2 BCDSEQ 1;
```

Notes:

1. A barcode cannot be positioned on or outside of the logical page.

   For example, the page definition below results in a position of 0 0 which is on the logical page boundary. **The following example results in a printer error:**

   ```
   PAGEDEF XMPL1 REPLACE YES;
   SETUNITS 1 IN 1 IN LINESP 6 LPI;
       FONT FNT1 CR10;
       FONT FNT2 CR10;
     PAGEFORMAT IBMSSN WIDTH 9.5 HEIGHT 4.0     /* PORTRAIT */
     DIRECTION ACROSS;
     PRINTLINE
       FONT FNT1 REPEAT 1 CHANNEL 1 POSITION 0 0;
        FIELD START 671 LENGTH 13 POSITION 0 0
         BARCODE 3OF9
         TYPE 1 MODWIDTH 17
         SSASTERISK ON;
   ```

2. If you want to suppress blanks, use the **SUPPBLANKS** parameter.

3. **SUPPBLANKS** for bar code data will cause the entire field to be ignored if it is all blanks.
4. Barcode Symbol Size

   The height of the barcode symbol is controlled by the barcode symbology definition and by various BCOCA parameters. The width of the symbol is usually dependent on the amount of data to be encoded and by choices made in various BCOCA parameters.

   Linear Symbologies

   The element-height and height-multiplier parameters specify the height of the symbol. For some barcode types, these parameters also include the height of the human-readable interpretation (HRI). Refer to the description of the element-height parameter in the *Data Stream and Object Architectures: Bar Code Object Content Architecture Reference*, S544-3766 for a description of the height for specific linear symbols. Some barcode symbologies (Australia Post Bar Code, Japan Postal Bar Code, POSTNET, RM4SCC, and REDTAG) explicitly specify the barcode symbol height; in this case, the element-height and height-multiplier parameters are ignored.

   Two-Dimensional Matrix Symbologies

   The MaxiCode symbology specifies a fixed physical size, nominally 28.14 mm wide by 26.91 mm high; the module-width, element-height, and height-multiplier parameters are ignored for MaxiCode values.

   Data Matrix symbols are rectangular and are made up of a pattern of light and dark squares (called modules). The size of each module is specified in the module-width parameter and the number of rows and columns of these modules is controlled by the desired-number-of-rows and desired-row-size parameters and the amount of data to be encoded. The element-height and height-multiplier parameters are ignored for Data Matrix symbols.

   QR Code symbols are square and are made up of a pattern of light and dark squares (called modules). The size of each module is specified in the module-width parameter; the number of rows and columns of these modules is controlled by the version parameter, the error correction level selected, and the amount of data to be encoded. The element-height and height-multiplier parameters are ignored for QR Code symbols.

   Two-Dimensional Stacked Symbologies

   PDF417 symbols are rectangular and are made up of a pattern of light and dark rectangles (called modules). The size of each module is specified in the module-width, element-height, and height-multiplier parameters and the number of rows and columns of these modules is controlled by the data-symbols and rows parameters and the amount of data to be encoded. A PDF417 symbol must contain at least three rows.

For more information about bar codes, see Appendix D, "More About Bar Code Parameters," on page 523 and refer to *Data Stream and Object Architectures: Bar Code Object Content Architecture Reference*, S544-3766.

name

Specifies a specific bar code name to be included in a page definition. The name is required if **BARCODE** will be used to reference or continue the bar code later, as is done for bar code concatenation.

TYPE { *n* | *type-name* }

Specifies the type of bar code symbol to be generated.

Note: If a type indicates "(same as *n*)", you may substitute the number given for the character name.

The following bar code types are supported:

type-name

Specifies a specific bar code type name to be included in a page definition.

CODE39 (same as 1)

Specifies a bar code type of Code 39 (3-of-9 code), Automatic Identification Manufacturers Uniform Symbol Specification 39.

MSI (same as 2)

Specifies a bar code type of modified Plessey code.

UPCA (same as 3)

Specifies a bar code type of Universal Product Code (United States) and the Canadian Grocery Product Code, Version A

UPCE (same as 5)

Specifies a bar code type of Universal Product Code (United States) and the Canadian Grocery Product Code, Version E

UPC2SUPP (same as 6)

Specifies a bar code type of Universal Product Code (United States) two-digit Supplemental (periodicals).

UPC5SUPP (same as 7)

Specifies a bar code type of Universal Product Code (United States) five-digit Supplemental (paperbacks).

EAN8 (same as 8)

Specifies a bar code type of European Article Numbering 8 (includes Japanese Article Numbering-short).

EAN13 (same as 9)

Specifies a bar code type of European Article Numbering 13 (includes Japanese Article Numbering-standard).

IND2OF5 (same as 10)

Specifies a bar code type of Industrial 2-of-5.

MAT2OF5 (same as 11)
Specifies a bar code type of Matrix 2-of-5.

ITL2OF5 (same as 12)
Specifies a bar code type of Interleaved 2-of-5, Automatic Identification Manufacturers Uniform Symbol Specification-I 2/5.

CDB2OF7 (same as 13)
Specifies a bar code type of Codabar, 2-of-7, Automatic Identification Manufacturers Uniform Symbol Specification-Codabar.

CODE128 (same as 17)
Specifies a bar code type of Code 128, Automatic Identification Manufacturers Uniform Symbol Specification-128.

Note: There is a subset of **CODE128** called **EAN128**. These **EAN128** bar codes can be produced with PPFA by specifying **CODE128** for the bar code type in the **PAGEDEF** and including the “extra” parts of the bar code in the data. The **UCC-128** bar code format is:

```
startcode FNC1 ai nnnnnnnnnnnnnnnnnn m c stopchar
```

The string of *n*s represents the bar code data. The start code, stop character, and 'c' value are generated by the printer microcode for BCOCA bar codes. The FNC1 is a hexadecimal 8F character. The “ai” is an application identifier and needs to be defined for use by each EAN128 application. The “m” is a modulo 10 check digit that must be calculated by the application and included in the bar code data.

Not all printers generate the **EAN128** bar codes, thus you may need to verify that the bar code produced in this manner is readable by your bar code scanner.

For more information about the **EAN128** bar codes, visit the Uniform Code Council WEB site at `http://www.UC-council.org`.

EAN2SUP (same as 22)
Specifies a bar code type of European Article Numbering, Two-digit Supplemental.

EAN5SUB (same as 23)
Specifies a bar code type of European Article Numbering, Five-digit Supplemental.

POSTNET (same as 24)
Specifies a bar code type of POSTal Numeric Encoding Technique (United States Postal Service), and defines specific values for the BSD module width, element height, height multiplier, and wide-to-narrow ratio fields.

Note: **POSTNET MOD 4** is normally called PLANET bar code. **POSTNET MOD 4** is supported by PPFA and some AFP printers.

RM4SCC (same as 26)
Specifies a 4-state customer code defined by the Royal Mail Postal Service of England for bar coding postal code information.

JPOSTAL (same as 27)
A complete Japan Postal Bar Code symbol consists of a set of distinct bars and spaces for each character followed by a modulo 19 checksum character and enclosed by a unique start character, stop character and quiet zones.

2DMATRIX (same as 28)
Specifies a Data Matrix two-dimensional bar code. Two-dimensional matrix symbologies (sometimes called area symbologies) allow large amounts of information to be encoded in a two-dimensional matrix. These symbologies are usually rectangular and require a quiet zone around all four sides; for example, the Data Matrix symbology requires a quiet zone at least one module wide around the symbol. Two-dimensional matrix symbologies use extensive data compaction and error correction codes, allowing large amounts of character or binary data to be encoded.

2DMAXI (same as 29)
Specifies a MaxiCode two-dimensional stacked bar code. Two-dimensional stacked symbologies allow large amounts of information to be encoded by effectively stacking short one-dimensional symbols in a row/column arrangement. This reduces the amount of space that is typically consumed by conventional linear bar code symbols and allows for a large variety of rectangular bar code shapes.

2DPDF417 (same as 30)
Specifies a PDF417 two-dimensional stacked bar code. Two-dimensional stacked symbologies allow large amounts of information to be encoded by effectively stacking short one-dimensional symbols in a row/column arrangement. This reduces the amount of space that is typically consumed by conventional linear bar code symbols and allows for a large variety of rectangular bar code shapes.

APOSTAL (same as 31)
Specifies the barcode type as defined by the Australian Postal Service.

2DQRCODE (same as 32)
Specifies a QR Code two-dimensional bar code. QR Code consists of a matrix of dark and light squares (modules). The matrix is also square and there are 40 sizes ranging from a matrix of 21 by 21 modules increasing by steps of 4 up to a matrix of 177 by 177

modules. Thus, up to 7089 numeric characters, 4296 alphabetic characters, 2953 8-bit characters, or 1817 Kanji characters can be contained on a single symbol, and up to 16 symbols can be logically linked together.

Since squares (modules) are square, the size of a module is determined by the **MODWIDTH** parameter only. The **HEIGHT** and **RATIO** parameters are not used.

CODE93 (same as 33)

Specifies a bar code type as defined by the AIM Uniform Symbology Specification - Code 93. This is a linear bar code similar to Code 39, but more complex.

US4STATE (same as 34 or US4ST)

Specifies a United States Postal Service (USPS) Four-State bar code. This parameter may be abbreviated as US4ST. This bar code is also known as the Intelligent Mail Bar Code.

The USPS Four-State bar code symbol has a fixed size; therefore the **HEIGHT** and **RATIO** parameters are not applicable and ignored. This bar code symbol allows a **MODWIDTH** parameter with two sizes **SMALL** and **OPTIMAL**. If you specify any other **MODWIDTH**, PPFA issues a warning message (RC=4), defaults to **OPTIMAL**, and continues generating the page definition. **MODWIDTH SMALL** prints a symbol approximately 2.575 inches wide and **MODWIDTH OPTIMAL** prints a symbol approximately 2.9 inches wide.

The input data is all numeric and consists of 5 data fields. The first 4 are fixed length; the fifth is variable length. The 5 fields are:

1. Application ID (2 digits) - the second digit must be 0 to 4 so that the valid values are 00-04, 01-14, etc. thru 90-94.
2. Special Services (3 digits) - assigned by the USPS; valid values are 000-999
3. Customer Identifier (6 digits) - assigned by the USPS; valid values are 000000-999999
4. Sequence Number (9 digits) - assigned by the mailer; valid values are 000000000-999999999
5. Delivery Point ZIP Code (0,5,9, or 11 digits) - refer to the **MOD** parameter below for valid values.

USPS Four-State modifiers (**MOD**) are defined as follows:

X'00' Present a USPS Four-State bar code symbol with no Delivery Point ZIP Code. The input data for this bar code symbol must be 20 numeric digits.

X'01' Present a USPS Four-State bar code symbol with a 5-digit Delivery Point ZIP Code. The input data for this bar code symbol must be 25 numeric digits. The valid values for the Delivery Point ZIP code are 00000-99999.

X'02' Present a USPS Four-State bar code symbol with a 9-digit Delivery Point ZIP Code. The input data for this bar code symbol must be 29 numeric digits. The valid values for the Delivery Point ZIP code are 000000000-999999999.

X'03' Present a USPS Four-State bar code symbol with a 11-digit Delivery Point ZIP Code. The input data for this bar code symbol must be 31 numeric digits. The valid values for the Delivery Point ZIP code are 00000000000-99999999999.

Note: You can print HRI with this symbol but it is not currently (Oct 2004) defined by the USPS. Consequently, PPFA defaults the **HRI** parameter to “**HRI OFF**” for this symbol. The USPS has said that in the future they plan to define HRI for some Special Services. “Track and Confirm” is an example of a Special Service that USPS does not currently define HRI but might in the future.

REDTAG (same as 35)
Specifies a 4-state bar code type defined by the Royal Mail Postal Service of England as RED TAG.

DATABAR (same as 36)
Specifies a bar code type of GS1 DataBar.

MOD

```
├──┬───────┬──────────────────────────────────────────┤
   └─MOD─n─┘
```

Specifies additional processing information about the bar code symbol to be generated (for example, **MOD** specifies whether a check-digit [10] should be generated for the bar code symbol).

n The meaning of *n* differs between the types. For more information, see Table 25 on page 532.

If **MOD** is not specified, the **MOD** value defaults as follows, depending on the bar code type specified:

TYPE	MOD	TYPE	MOD
1	1	22	0
2	1	23	0
3	0	24	0
5	0	26	0
6	0	27	0
7	0	28	0
8	0	29	0
9	0	30	0

---

[10] Check digits are a method of verifying data integrity during the bar code reading process.

TYPE	MOD	TYPE	MOD
10	1	31	1
11	1	32	2
12	1	33	0
13	1	35	1
17	2	36	0

HRI

```
├──┬────────────────────────────────────────────┬───────────┤
   └─HRI──┬─ON────┬──┬─────────────────────┬──┘
          ├─ABOVE─┤  └─HRIFONT──fontname──┘
          ├─BELOW─┤
          ├─OFF───┤
          └─ONLY──┘
```

Specifies the human-readable interpretation (text characters) to be generated and placed above or below the bar code symbol, as directed.

ON Specifies that **HRI** should be generated at the default location for the barcode type.

ABOVE
Specifies that **HRI** should be placed above the bar code symbol.

BELOW
Specifies that **HRI** should be placed below the bar code symbol.

OFF Specifies that **HRI** should not be generated.

ONLY Specifies that only the **HRI** is to be printed. No barcode symbol is to be generated. The **POSITION** parameters on the **FIELD** command specify the placement position for the first character of the **HRI**.

Note: Not all barcode printers honor the request to suppress printing the barcode symbol.

Notes:

1. If **HRI** is requested, and **HRI** font isn't, the printer default font is used to render the **HRI**, instead of the font specified on the **FIELD FONT** subcommand.
2. **HRI** is not supported by any of the 2D bar codes.

HRIFONT *fontname*
Specifies the local name of a font used in printing the **HRI** for the barcode. This font must first be defined in a previous font command in the page definition.

SSASTERISK

```
├──┬─────────────────────────┬─────────────────────────┤
   └─SSASTERISK──┬─ON──┬─┘
                 └─OFF─┘
```

Specifies whether an asterisk is to be generated as the **HRI** for **CODE39** bar code start and stop characters.

Note: **SSASTERISK** is ignored by all bar code types except **CODE39**.

ON
Specifies that start and stop characters should be generated in the **HRI**.

OFF
Specifies that start and stop characters should not be generated in the **HRI**.

WIDTH

```
├──┬──────────────────────┬──────────────────────────────────┤
   └─WIDTH──n──┬────────┬─┘
               ├─IN─────┤
               ├─MM─────┤
               ├─CM─────┤
               ├─POINTS─┤
               └─PELS───┘
```

Specifies the width of the whole bar code symbol.

n Specifies the width value of the whole bar code symbol. The *n* value can be up to 3 decimal places.

HEIGHT

```
├──┬───────────────────────┬─────────────────────────────────┤
   └─HEIGHT──n──┬────────┬─┘
                ├─IN─────┤
                ├─MM─────┤
                ├─CM─────┤
                ├─POINTS─┤
                └─PELS───┘
```

Specifies the height of bar code element. For UPC and EAN bar codes, the total height includes the bar code and the **HRI** characters.
If **HEIGHT** is not specified, the printer default height is used.

Note: **HEIGHT** is ignored by bar code types that explicitly specify the element heights (for example, **POSTNET** or **RM4SCC**).

n Specifies the height of the bar code. The *n* value can be up to 3 decimal places.

unit
Specifies a unit of measurement for the **HEIGHT** parameter. The choices are **IN**, **MM**, **CM**, **POINTS**, or **PELS**.

Notes:

1. If no unit is specified, the default is the most recent **SETUNITS** command value or **IN** (inch) if a **SETUNITS** command has not been issued.
2. Height for the 2D barcode PDF417 specifies the height of a bar or row (not the total height of the symbol).

MODWIDTH

```
   ┌─MODWIDTH──OPTIMAL──────┐
├──┤                        ├────────────────────────────────────────┤
   └─MODWIDTH───┬─n───────┬─┘
                ├─OPTIMAL─┤
                └─SMALL───┘
```

Specifies the width of the smallest defined bar code element, using mils (thousandths of an inch). The range of values allowed is 1-254. If **MODWIDTH** is not specified, the printer default **MODWIDTH** is used; the printer default yields the optimum scanable symbol.

n Specifies the width of each module, using thousandths of an inch (1/1000) as the unit of measurement.

OPTIMAL
Specifies that the printer chooses the optimal module width. This value is recommended. It is the default value when **MODWIDTH** is not coded.

SMALL
Specifies that the PPFA chooses a module width that produces the smallest symbol that meets the symbology tolerances.

Note: Because this symbol is at the lower boundary of the symbology-defined tolerance range, external conditions such as printer contrast setting, toner consistency, paper absorbency, and so forth, might cause this symbol to scan improperly.

Code Examples:

```
PAGEDEF 4SXM1   REPLACE YES;
  FONT FN1;

  PRINTLINE ;
   FIELD START 1  LENGTH 20 BARCODE BC1 TYPE US4ST;

  PRINTLINE ;
   FIELD START 01 LENGTH 20 BARCODE bc2 TYPE US4STATE MOD 0
     MODWIDTH OPTIMAL;
  PRINTLINE ;
   FIELD START 41 LENGTH 25 BARCODE bc3 TYPE US4STATE MOD 1
     MODWIDTH SMALL  ;
  PRINTLINE ;
   FIELD START 66 LENGTH 29 BARCODE bc4 TYPE US4STATE MOD 2
     MODWIDTH SMALL  ;
  PRINTLINE ;
   FIELD START 66 LENGTH 31 BARCODE bc5 TYPE US4STATE MOD 3
     MODWIDTH SMALL  ;
  PRINTLINE ;
   FIELD START 66 LENGTH 31 BARCODE bc6 TYPE US4STATE MOD 3
     MODWIDTH 15     ;
```

In the previous example:

- There are **FIELD BARCODE** commands for the new “Four State” bar code with default Modifier, and explicit Modifiers each with the proper field length.
- There are **FIELD BARCODE** commands using the new **MODWIDTH** parameters **SMALL** and **OPTIMAL**.

- And one example **BARCODE** command using an explicit **MODWIDTH** parameter which should result in an informational message and a **MODWIDTH** of **OPTIMAL**.

BCOLOR

```
├──┬─BCCOLOR──colorname──────────────────────────────────────┬──────┤
   ├─RGB──rvalue──gvalue──bvalue─────────────────────────────┤
   ├─HIGHLIGHT──hvalue──┬──────────────────┬──┬──────────────┬┤
   │                    └─COVERATE──cvalue─┘  └─BLACK──bvalue─┘│
   ├─CMYK──cvalue──mvalue──yvalue──kvalue────────────────────┤
   └─CIELAB──lvalue──(-)──cvluae──(-)──c2value───────────────┘
```

Specifies an **OCA** color or a defined color to be used in printing the barcode and its HRI. Defined colors are specified with the **DEFINE COLOR** command.

colorname

Values for color names are:

- A defined color (defined by the **DEFINE COLOR** command)
- **NONE**
- **DEFAULT**
- **BLACK**
- **BLUE**
- **BROWN**
- **GREEN**
- **PINK**
- **RED**
- **TURQ** (turquoise)
- **YELLOW**
- **ORANGE**
- **PURPLE**
- **MUSTARD**
- **GRAY**
- **DARKBLUE**
- **DARKGREEN**
- **DARKTURQ** (dark turquoise)

The color choices depend on the printer. **NONE** is the color of the medium. **DEFAULT** is the printer default color.

Color-Model

Specifies the color of print for this field supported in MODCA for the Red/Green/Blue color model (RGB), the highlight color space, the Cyan/Magenta/Yellow/ Black color model (CMYK), and the CIELAB color model.

Code Example: In the following example, 4 bar codes are defined which use color.

1. The first uses a predefined non-OCA color.
2. The second uses an OCA color which isn't predefined.
3. The third uses a predefined OCA color.
4. The fourth uses a CMYK color model directly.

Example:

```
/*--------------------------------------------------------*/
/* CMRX13  - Full Color on Bar Code                       */
/*                                                        */
/*                                                        */
/*--------------------------------------------------------*/
/* Traditional pagedef                                    */
/*--------------------------------------------------------*/
 Pagedef cmx14P  replace yes;

   DEFINE ocablue COLOR OCA       blue           ;
   DEFINE cymkyel COLOR CMYK      50 30 30 30     ;

   FONT fte  egt12   TYPE ebcdic;

   PAGEFORMAT pf1;
     PRINTLINE;
     FIELD  START 50 LENGTH 8 RGB 30 25 25
     BARCODE  AUST1 TYPE APOSTAL  MOD 2
            BCCOLOR cymkyel    /* PRE-DEFINED NON-OCA COLOR   */
            HEIGHT .5 IN;
     FIELD  START 5 LENGTH 5 BARCODE  BCCO   TYPE POSTNET
            BCCOLOR RED        /* OCA COLOR                   */
            HEIGHT .5 IN;
     FIELD  START 5 LENGTH 5 BARCODE  BCCO1  TYPE POSTNET
            BCCOLOR ocablue    /* Defined     OCA COLOR       */
            HEIGHT .5 IN;
     FIELD  START 5 LENGTH 5 BARCODE  BCCO2  TYPE POSTNET
            CMYK 50 30 30 30          /* direct cmyk color   */
            HEIGHT .5 IN;

/*--------------------------------------------------------*/
/* Record Fmt  pagedef                                    */
/*--------------------------------------------------------*/
 Pagedef cmx14L  replace yes;

   DEFINE ocablue COLOR OCA       blue           ;
   Define rgbred  COLOR RGB       30 25 25       ;
   DEFINE cymkyel COLOR CMYK      50 30 30 30     ;
   DEFINE HIgreen COLOR HIGHLIGHT 100  coverage 50;
   DEFINE cieblue COLOR cielab    40 90 95       ;

   FONT fte  egt12   TYPE ebcdic;    /* type ebcdic   */

   PAGEFORMAT pf1;
   LAYOUT 'l1';
     FIELD  START 50 LENGTH 8 RGB 30 25 25
     BARCODE  AUST1 TYPE APOSTAL  MOD 2
            BCCOLOR cymkyel    /* PRE-DEFINED NON-OCA COLOR   */
            HEIGHT .5 IN;
     FIELD  START 5 LENGTH 8 BARCODE  AUST2  TYPE APOSTAL  MOD 2
            BCCOLOR RED        /* NON PRE-DEFINED OCA COLOR   */
            HEIGHT .5 IN;
     FIELD  START 5 LENGTH 5 BARCODE  BCCO   TYPE POSTNET
            BCCOLOR OCABLUE    /* PRE-DEFINED OCA COLOR       */
            HEIGHT .5 IN;
     FIELD  START 5 LENGTH 5 BARCODE  BCCO2  TYPE POSTNET
                    CMYK 50 30 30 30   /* direct cmyk color   */
            HEIGHT .5 IN;


/*--------------------------------------------------------*/
/* XML         pagedef                                    */
/*--------------------------------------------------------*/
 Pagedef cmx14X  replace yes;

   DEFINE ocablue COLOR OCA       blue           ;
   Define rgbred  COLOR RGB       30 25 25       ;
```

```
DEFINE cymkyel COLOR CMYK      50 30 30 30     ;
DEFINE HIgreen COLOR HIGHLIGHT 100  coverage 50;
DEFINE cieblue COLOR cielab    40 90 95        ;

DEFINE cn QTAG  'cust','name' ;
FONT fte  egt12   TYPE ebcdic;    /* type ebcdic   */

PAGEFORMAT pf1;
XLAYOUT cn;
  FIELD  START 50 LENGTH 8 RGB 30 25 25
  BARCODE  AUST1 TYPE APOSTAL  MOD 2
         BCCOLOR cymkyel    /* PRE-DEFINED NON-OCA COLOR   */
         HEIGHT .5 IN;
  FIELD  START 5 LENGTH 8 BARCODE  AUST2  TYPE APOSTAL  MOD 2
         BCCOLOR RED        /* NON PRE-DEFINED OCA COLOR   */
         HEIGHT .5 IN;
  FIELD  START 5 LENGTH 5 BARCODE  BCCO   TYPE POSTNET
         BCCOLOR OCABLUE    /* PRE-DEFINED OCA COLOR       */
         HEIGHT .5 IN;
  FIELD  START 5 LENGTH 5 BARCODE  BCCO2  TYPE POSTNET
                 CMYK 50 30 30 30   /* direct cmyk color   */
         HEIGHT .5 IN;
```

SUPPBLANKS

```
├──┬──────────────┬──────────────────────────────────────┤
   └─SUPPBLANKS───┘
```

Suppress the trailing blanks in the data field used to generate the barcode.

When the page definition selects any of the EAN, UPC or Postnet bar code types and modifiers and have also requested that trailing blanks be truncated for the bar code field, the print server examines the resulting data length and choose the correct bar code type and modifier for the bar code object created.

Note: If the data length does not match any of the bar code type and modifier combinations, the print server uses the original bar code type and modifier requested to build the bar code object.

RATIO

```
├──┬─────────────┬──────────────────────────────────────┤
   └─RATIO── n───┘
```

Specifies the ratio between the width of the wide and the narrow bar code elements. The range of values allowed is 100-500, but you must specify a value appropriate for your printer and bar code type or you will get errors at print time.

If **RATIO** is not specified, the printer default ratio is used.

n The **RATIO** is specified as a percent value. For example, form *nnn*. For example, 200 represents a ratio of 2 to 1; 250 represents a ratio of 2.5 to 1. For most bar code symbols, the **RATIO** value should be between 200 and 300. For bar code types that explicitly specify the module width (for example, **POSTNET** and **RM4SCC**, this field is ignored. If **RATIO** is not specified, the default ratio for the bar code symbol is used.

CMR

```
     ┌──────────────────────────────────┐
     ▼                                  │
├───┬─CMR──cmr-lname───┬─AUDIT─┬─┬──────┴──────────────────────────┤
    └                  ├─INSTR─┤ ┘
                       └─LINK──┘
```

Note: See Chapter 8, “AFP Color Management,” on page 173 for more information about using the CMR subcommand.

Specify a Color management resource (CMR) and its process mode for a bar code object within the page definition.

cmr-lname

The **CMR** local name. This name must have been defined with a **DEFINE CMRNAME** command.

Note: This parameter must immediately follow the **CMR** keyword.

processing mode parameter

Specify the processing mode for the **CMR**.

AUDIT

Process this **CMR** as an audit CMR.

INSTR

Process this **CMR** as an instruction CMR.

LINK Process this **CMR** as a link CMR. This processing mode is only valid for device link (DL) CMRs.

Code Example: In the following example, 2 bar codes are defined with CMRs specified. The bar codes is defined for traditional, record format and XML page definitions.

Note: The **DEFINE CMRNAME**s for “mycmr” and “dark1” are used in each page definition but defined only once. Page definitions that are compiled together can only define a local **CMR** name once. This is because a **DEFINE CMRNAME** definition is global for all page definitions and form definitions in the same set of source code.

```
 DEFINE mycmr  CMRNAME ... ;
 DEFINE dark1  CMRNAME ... ;


/* Traditional Pagedef         */
PAGEDEF cmr10P  REPLACE yes;
  PRINTLINE;
    FIELD Start 1 Length 20
     BARCODE TYPE code39 MOD 1
       CMR myCMR  audit;
    FIELD Start 21 Length 40
     BARCODE TYPE code39 MOD 1
       CMR dark1  instr;

/* Record Layout Pagedef       */
```

```
PAGEDEF cmr10L  REPLACE yes;
  Font f1;
  LAYOUT 'l1';
    FIELD Start 1 Length 20
     BARCODE TYPE code39 MOD 1
       CMR myCMR  audit;
    FIELD Start 21 Length 40
     BARCODE TYPE code39 MOD 1
       CMR dark1  instr;

/* XML Pagedef                  */
PAGEDEF cmr10X  REPLACE yes;
  Font f1 TYPE ebcdic;
  XLAYOUT QTAG 'x1';
    FIELD Start 1 Length 20
     BARCODE TYPE code39 MOD 1
       CMR myCMR  audit;
    FIELD Start 21 Length 40
     BARCODE TYPE code39 MOD 1
       CMR dark1  instr;
```

BCXPARMS

2D BARCODE Parameters:

```
              ┌─ESC───┐  ┌─NOE2A──────────────────┐
├──BCXPARMS───┼───────┼──┼────────────────────────┼──┬──────────────────────────────────┬──────────┤
              └─NOESC─┘  └─E2A──┬─CP500─────────┐  │  ├──┤ Data Matrix 2D Parameters ├──┤
                                ├─CP290─────────┼──┘  ├──┤ MaxiCode 2D Parameters ├─────┤
                                ├─CP1027────────┤     ├──┤ PDF417 2D Parameters ├───────┤
                                ├─CV1390To943───┤     └──┤ QRCODE 2D Parameters ├───────┘
                                ├─CV1399To943───┤
                                ├─CV1390To942───┤
                                ├─CV1399To942───┤
                                ├─CV1390To932───┤
                                └─CV1399To932───┘
```

Common 2D Parameters: These barcode parameters are common for all for two-dimensional barcode types.

Note: See the *Bar Code Object Content Architecture (BCOCA) Reference*, S544-3766 and Appendix D, "More About Bar Code Parameters," on page 523 for more details on these extra parameters.

Escape Sequence Processing
Specifies whether or not to process escape sequences in the data.

Note: If the EBCDIC to ASCII flag is set (**E2A**), all characters are converted ASCII first so that the EBCDIC backslash characters (X'E0') are converted to ASCII (X'5C') before the escape sequence handling is applied.

ESC
Escape Sequence Handling. This is the default if neither is coded. When this parameter is coded or defaulted, each backslash character within the barcode data is treated as an escape character according to the particular barcode symbology specification.

NOESC

Ignore Escape Sequences. When this parameter is coded, each backslash character within the bar code data is treated as a normal data character. Note that in this case no code page switching can occur within the data.

EBCDIC to ASCII translation

Determines whether or not to translate the data.

Note: Only QRCODE uses the **E2A** code page parameters.

E2A

EBCDIC to ASCII translation for all two-dimensional barcodes.

- For Data Matrix and MaxiCode the printer converts each byte of the data from EBCDIC codepage 500 to ASCII codepage 819.
- For PDF417 the printer converts each byte of the barcode data and each byte of the Macro PDF417 control block data from a subset of EBCDIC codepage 500 into ASCII. This translation covers 181 code points which includes alphanumerics and many symbols. The code points that are ***not*** covered by the translation do not occur in EBCDIC and are mapped, by the printer, to the X'7F' (127) code point. ***Do not use the following EBCDIC code points for PDF417:***

Table 12. EBCDIC Code Points not used with the E2A Command

X'04'	X'06'	X'08'	X'09'	X'0A'	X'14'	X'15'	X'17'
X'1A'	X'1B'	X'20'	X'21'	X'22'	X'23'	X'24'	X'28'
X'29'	X'2A'	X'2B'	X'2C'	X'30'	X'31'	X'33'	X'34'
X'35'	X'36'	X'38'	X'39'	X'3A'	X'3B'	X'3E'	X'46'
X'62'	X'64'	X'65'	X'66'	X'6A'	X'6B'	X'6C'	X'6D'
X'6E'	X'6F'	X'70'	X'72'	X'73'	X'74'	X'75'	X'76'
X'77'	X'78'	X'80'	X'8C'	X'8D'	X'8E'	X'9D'	X'9F'
X'AC'	X'AD'	X'AE'	X'AF'	X'B4'	X'B5'	X'B6'	X'B9'
X'BC'	X'BD'	X'BE'	X'BF'	X'CA'	X'CF'	X'DA'	X'EB'
X'ED'	X'EE'	X'EF'	X'FA'	X'FB'	X'FD'	X'FE'	X'FF'

Note: If you choose this option, have PDF417 Macro data, and are running on an ASCII platform (AIX, Windows NT®, or Windows 2000), your PDF417 Macro data is already in ASCII, but the **E2A** command signals the printer to convert the data. A problem occurs because the PDF417 Macro data you code is ASCII, the line data is EBCDIC, and the printer cannot tell the difference. To avoid this problem, PPFA converts the macro data to EBCDIC codepage 500 by treating the ASCII platform as codepage 819. If any of the data code points map to the code points in Table 12 PPFA issues an error message and does not generate a page definition. ***Do not use the***

code points in Table 13 when coding a PDF417 Macro and generating a page definition on an ASCII platform while translating the data from EBCDIC to ASCII* (E2A)*:

Table 13. ASCII Code Points not used with the E2A Command

X'80'	X'81'	X'82'	X'83'	X'84'	X'85'	X'86'	X'87'
X'88'	X'89'	X'8A'	X'8B'	X'8C'	X'8D'	X'8E'	X'8F'
X'90'	X'91'	X'92'	X'93'	X'94'	X'95'	X'96'	X'97'
X'98'	X'99'	X'9A'	X'9B'	X'9C'	X'9D'	X'9E'	X'A4'
X'A6'	X'A7'	X'A8'	X'A9'	X'AE'	X'AF'	X'B4'	X'B6'
X'B8'	X'BE'	X'C0'	X'C1'	X'C2'	X'C3'	X'C8'	X'CA'
X'CB'	X'CC'	X'CD'	X'CE'	X'CF'	X'D0'	X'D7'	X'D8'
X'DD'	X'DE'	X'E3'	X'F0'	X'F8'	X'FD'	X'FE'	

- QRCODE - The default coding for QRCODE is ECI 000020 which is equivalent to the IBM ASCII code page 897. When translation is required, you must enter the code page to use for translation. There are 3 choices. Each choice causes the printer to translate from the code page into ASCII code page 897 before the data is used to build the barcode symbol:
  - – EBCDIC code page 500 (International #5). Only 128 bytes of this code page can be translated into ECI 000020. These code points are specified in “QR Code Special-Function Parameters” on page 579.
  - – EBCDIC code page 290 (Japanese Katakana Extended).
  - – EBCDIC code page 1027 (Japanese Latin Extended).

The first three values are used when the input data is encoded with a single-byte EBCDIC code page. The parameter identifies the EBCDIC code page that encodes single-byte EBCDIC bar code data:

CP500
Code page 500 (International #5) Only 128 of the characters within ECI 000020 can be specified in code page 500. The code page 500 characters that can be translated are shown in the *Bar Code Object Content Architecture Reference*, S544-3766.

CP290
Code page 290 (Japanese Katakana Extended)

CP1027
Code page 1027 (Japanese Latin Extended)

The following parameters are used when the input data is SOSI. Each parameter identifies a specific conversion from EBCDIC SOSI input data to a specific mixed-byte ASCII encoding:

CV1390To943 Translates EBCDIC data CCSID 1390 code points to ASCII Shift-JIS CCSID 943 code points.

CV1399To943	Translates EBCDIC data CCSID 1399 code points to ASCII Shift-JIS CCSID 943 code points.
CV1390To932	Translates EBCDIC data CCSID 1390 code points to ASCII Shift-JIS CCSID 932 code points.
CV1399To932	Translates EBCDIC data CCSID 1399 code points to ASCII Shift-JIS CCSID 932 code points.
CV1390To942	Translates EBCDIC data CCSID 1390 code points to ASCII Shift-JIS CCSID 942 code points.
CV1399To942	Translates EBCDIC data CCSID 1399 code points to ASCII Shift-JIS CCSID 942 code points.

Note: CCSID definitions:

CCSID 932	Japanese PC Data Mixed including 1880 UDC.
CCSID 942	Japanese PC Data Mixed including 1880 UDC, Extended SBCS.
CCSID 943	Japanese PC Data Mixed for Open environment (Multi-vendor code): 6878 JIS X 0208-1990 chars, 386 IBM selected DBCS chars, 1880 UDC (X'F040' to X'F9FC')
CCSID 1390	Extended Japanese Katakana-Kanji Host Mixed for JIS X0213 including 6205 UDC, Extended SBCS (includes SBCS and DBCS euro)
CCSID 1399	Extended Japanese Latin-Kanji Host Mixed for JIS X0213 including 6205 UDC, Extended SBCS (includes SBCS and DBCS euro)

NOE2A

No translation. This is the default if neither is coded. This parameter is used for all two-dimensional barcodes. No translation is done by the printer or PPFA. The barcode data is assumed to be the default coding as defined in the AIM Uniform Symbology Specification.

DataMatrix 2D parameters: These parameters are for Data Matrix 2D barcodes.

SIZE

```
     ┌─unspecified──────────┐
├────┼──────────────────────┼───────────────────────┤
     └─SIZE─rows──┬────┬─cols─┘
                  └─BY─┘
```

The size of the two-dimensional barcode. The number of rows and columns (row size) in the symbol. The allowable values for rows and columns are specified in . If size is not coded, the size is marked as unspecified and the appropriate number of rows and columns are used based on the amount of data.

unspecified
: Unspecified size. The **SIZE** parameter isn't coded. The appropriate number of rows and columns will be used based on the amount of data being presented.

rows **BY** *cols*
: The desired number of rows including the finder pattern and the desired number of columns (or modules) in each row including the finder pattern. The keyword **BY** is optional. The rows and columns must be one of the allowed combinations in Table 29 on page 566.

SEQUENCE

```
├────┬─────────────────────────────────────────────────────────┬────┤
     │                                ┌─ID─1─1─────────────┐   │
     └─SEQUENCE─seq──┬────┬─tot───────┼────────────────────┼───┘
                     └─OF─┘           └─ID─uidHi─uidLo─────┘
```

Structured append sequence indicator. Some two-dimensional barcodes can be logically linked together to encode large amounts of data. The logically linked symbols can be presented on the same or different media and are logically recombined after they are scanned. PPFA checks the numbers for obvious errors as well as the proper number range. For example, **SEQUENCE 5 OF 3** is obviously wrong.

sqn
: Structured-append sequence indicator. This parameter is an integer whose acceptable range of values is dependent on the barcode type. The range for this parameter is 1 to 16.

OF
: Optional parameter for readability.

tot Total number of structured-append symbols. This parameter is an integer whose acceptable range of values is dependent on the barcode type. The range of this parameter is 2 to 16.

ID *uidHi uidLo*
: The high and low order bytes of a unique file identification for a set of structured-append symbols. Each is a unique number between 1 and 254 and identifies this set of symbols. The actual File ID is computed by 256 times *uidHi* plus *uidLo*.

Data Matrix Special Functions

```
    ┌─USERDEF──────┐
├───┼──────────────┼────────────────────────────────────────────────┤
    ├─FNC1UCC──────┤
    ├─FN1IND───────┤
    ├─RDRPROG──────┤
    ├─MAC5─────────┤
    ├─MAC6─────────┤
    └─ENCODE──type─┘
```

These are special functions which can only be used with a Data Matrix symbol. If not coded, the default is **USERDEF** (user defined symbol).

FNC1UCC	UCC/EAN FNC1 alternate data type identifier. A FNC1 is added in the first data position (or fifth position of a structured append symbol) to indicate that this bar code symbol conforms to the UCC/EAN application identifier standard format.
FNC1IND	Industry FNC1 alternate data type identifier. An FNC1 is added in the second data position (or sixth data position of a structured append symbol) to indicate that this bar code symbol conforms to a particular industry standard format.
RDRPROG	Use this when the symbol contains a message used to program the barcode reader. In this case the barcode symbol cannot be a part of a structured append sequence.
MAC5	This provides instructions to the bar code reader to insert an industry specific header and trailer around the symbol data. The bar code symbol contains a 05 Macro codeword. The barcode symbol cannot be a part of a structured append sequence.
MAC6	Same as **MAC5** except the bar code symbol contains a 06 Macro codeword. The barcode symbol cannot be a part of a structured append sequence.
ENCODE	Data Matrix bar code encodation scheme.
type	Specifies the Data Matrix bar code encodation scheme. These encodation schemes are supported.

DEFAULT

This uses a device-specific method of selecting and switching among encodation schemes. If you are unsure of which encodation scheme to use, device default is a good choice.

ASCII

This encodation scheme produces 4 bits per data character for double digit numerics, 8 bits per data character for ASCII values 0–127, and 16 bits per data character for Extended ASCII values 128–255.

C40
This encodation scheme is used when the input data is primarily upper-case alphanumeric.

Text
This encodation scheme is used when the input data is primarily lower-case alphanumeric.

X12
This encodation scheme is used when the input data is defined with the ANSI X12 EDI data set.

EDIFACT
This encodation scheme is used when the input data is ASCII values 32–94.

BASE256
This encodation scheme is used when the data is binary (for example image or non-text data).

AUTO
Starts with ASCII encodation and switches between encodation schemes as needed to produce the minimum symbol data characters.

USERDEF None of the above. This is a user defined data symbol with no Header or Trailer instructions to the reader.

MaxiCode 2D Parameters: These parameters are for MaxiCode 2D barcodes.

MODE

```
   ┌─MODE 4──┐
├──┤         ├──────────────────────────────────────┤
   └─MODE md─┘
```

Symbol mode (used for MaxiCode two-dimensional barcode only). If not coded, the default is Standard Symbol Mode 4.

2 Structured Carrier Message — numeric postal code

3 Structured Carrier Message — alphanumeric postal code

4 Standard symbol (default)

5 not supported

6 The bar code data is used to program the bar code reader system.

SEQUENCE

```
├──┬─────────────────────────────┬─────────────────────┤
   └─SEQUENCE──seq──┬────┬──tot──┘
                    └─OF─┘
```

Structured append sequence indicator. Some two-dimensional barcodes can be logically linked together to encode large amounts of data. The logically linked symbols can be presented on the same or different media and are logically recombined after they are scanned. PPFA checks the numbers for obvious errors as well as the proper number range. For example, **SEQUENCE 5 OF 3** is obviously wrong.

sqn	Structured-append sequence indicator. This parameter is an integer whose acceptable range of values is dependent on the barcode type. The range of this parameter is 1 to 8.
OF	Optional parameter for readability.
tot	Total number of structured-append symbols. This parameter is an integer whose acceptable range of values is dependent on the barcode type. The range for this parameter is 2 to 8.

Zipper Pattern

```
   ┌─NOZIPPER─┐
├──┼──────────┼────────────────────────────────────────┤
   └─ZIPPER───┘
```

Print a zipper pattern and contrast block (use for MaxiCode two-dimensional barcode only)

NOZIPPER	Does not print a zipper pattern.
ZIPPER	Prints a zipper pattern.

PDF417 2D Parameters These parameters are for PDF417 2D barcodes.

SIZE

```
   ┌─SIZE──MIN──10───────────────────────────────────┐
├──┼─────────────────────────────────────────────────┼──────┤
   └─SIZE──┬─MIN──────────┬──┬────┬──cols (1-30)─────┘
           └─rows (3-80)──┘  └─BY─┘
```

The size of the two-dimensional barcode. The number of rows and number of columns (number of data symbol characters per row). These numbers do not include the start patterns or left and right row indicators. The allowable values for *rows* are 3 to 90, the allowable values for *cols* are 1 to 30, but their product cannot exceed 928. If size is not coded, the default is **MIN** number of *rows* and 10 *cols* (characters per row).

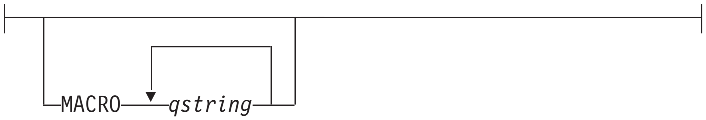
rows	The desired number of rows.
MIN	Instructs the printer to use the minimum number of rows necessary to print the symbol.

cols The desired number of data symbol characters in a row.

SECLEV

This parameter specifies the desired security level for the symbol as a value from **0** to **8**. Each higher security level causes more error correction codewords to be added to the symbol (used for PDF417 two-dimensional barcode only). If not coded, the default is Security level **0**.

MACRO

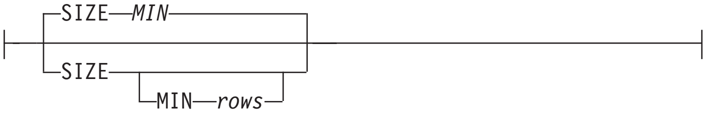


PDF417 Macro data. The total length of macro text is limited to 28,000 bytes.[11]

qstring
A quoted string. The string does not extend across records, but you can code multiple quoted strings. Code the **MACRO** keyword only once.

QRCODE 2D Parameters: These parameters are for QRCODE 2D barcodes.

SIZE



The desired size (in rows and columns of the QRCODE barcode. This symbol is square so both rows and columns will be the same. The allowable values for rows and columns are from 21 to 177 increments of 4. These are also specified in Table 31 on page 583. The size in *rows* by *cols* is from 21 to 177 in increments of 4.

rows
The desired number of rows and columns.

MIN
Instructs the printer to use the minimum number of rows necessary to print the symbol.

SEQUENCE

---

[11] This limit is imposed by the data stream architecture. The total number of bytes allowed in a structured field is 32,000. Macro data has to be shared with triplets, barcode data (which can be up to 2710 bytes), and other overhead.

```
├──┬─────────────────────────────────────────────────┬────┤
   └─SEQUENCE─seq──┬────┬─tot──┬─────────────────┬─┘
                   └─OF─┘      └─PARITY─X'dd'─┘
```

QR barcodes can be logically linked together to encode large amounts of data. The logically linked symbols can be presented on the same or different media and are logically recombined after they are scanned. PPFA checks the numbers for obvious errors as well as the proper number range. For example, **SEQUENCE 5 OF 3** is obviously wrong.

seq Structured-append sequence indicator. This parameter is an integer whose acceptable range of values is 1 to 16.

OF
Optional parameter for readability.

tot Total number of structured-append sequences indicator. This parameter is an integer whose acceptable range of values is 2 to 16.

PARITY X'*dd***'**
Structured append parity data. This parameter is used for the QR Code 2D barcode only when it has linked structured-append symbols. The parameter specifies the parity byte for the entire collection of linked structured-append symbols. The parity byte is the same for each symbol in the collection and is obtained by doing an "exclusive or" function on all of the bytes of the ASCII data in all symbols of the collection. If this symbol is not structured-append symbol, the parity parameter is ignored.

X'*dd***'**
The parity data byte. It must be entered as two hexadecimal digits (X'0'—X'F'). As for all hexadecimal digits in PPFA, the digits must be uppercase if they are X'A' through X'F'.

ECLEV

```
   ┌─ECLEV──L──────┐
├──┼───────────────┼──────────────────────────┤
   └─ECLEV──┬─M─┬──┘
            ├─Q─┤
            └─H─┘
```

Error Correction Level. It specifies the level of error correction to be used for the symbol. Each higher level of error correction causes more error correction code words to be added to the symbol and therefor leaves fewer code words for the data. Refer to the particular barcode symbology specification for more information. Four different levels of Reed-Solomon error correction can be selected:

L Level **L** allows recovery of 7% of symbol code words.

M Level **M** allows recovery of 15% of symbol code words.

Q Level **Q** allows recovery of 25% of symbol code words.

H Level **H** allows recovery of 30% of symbol code words.

Special Functions

```
   ┌─USERDEF─────────────┐
├──┼─────────────────────┼──────────────────────────────┤
   ├─FNC1UCC─────────────┤
   └─FNC1IND──AI──'ai'───┘
```

These are special functions which can be used with QR Code 2D symbols. If not coded, the default is **USERDEF** (user-defined symbol).

FNC1UCC
UCC/EAN FNC1 alternate data type identifier. The symbol indicates that this QR Code symbol conforms to the UCC/EAN application identifiers standard.

FNC1IND
Industry FNC1 alternate data type identifier. The symbol indicates that this QR Code symbol conforms to the specific industry or application specifications previously agreed with AIM International. When this standard is selected, an application indicator must be specified.

AI '*ai*'
Application indicator for Industry FNC1. This is coded as a single upper or lower case alphabetic character, or a 2-digit number. It must be enclosed in single quotes. This parameter is required for QR Code barcodes when **FNC1IND** is coded.

USERDEF
None of the above. This is a user-defined symbol with either no significance or “user-defined” significance assigned to all FNC1 characters appearing in the symbol.

QR CODE Barcode Examples

```
PAGEDEF QNXmp Replace Yes;

 PRINTLINE;
   FIELD START 1 LENGTH 4400 BARCODE bc3p     TYPE 2DQRCODE
       BCXPARMS E2A CP500
                noesc
                SIZE 025
                ECLEV M
                SEQUENCE 1 of 7
                PARITY x'7A'
                FNC1IND AI 'a'
                ;
```

In the previous example:

- A QR Code 2D barcode is placed. The data is encoded in EBCDIC with CodePage 500. We want the bar code to be 25 by 25 squares and have error correction level of **M** which allows recovery of 15% of symbol code words.
- This is the first of seven symbols which are to be linked together by the barcode reader application program. The parity-data value for all symbols is a hexadecimal X'7A'. Parity should be the same for all the linked symbols and is obtained by doing an "exclusive or" function on all of the bytes of the ASCII value of all the original input data.
- The QR Code symbol conforms to industry specifications for application indicator "a".

Concatenated BARCODE Parameters:

```
├──BCDSYMB──┬─symname─────┬───────────────────────────────────────────────────────────────┤
            ├─BCDSEQ──seq#─┤
            └─BCDNEW───────┘
```

BCDSYMB *symname*

Specifies Bar code data collection symbol. Names a bar code data collection. All bar code data described with **FIELD** command and bar codes with this name will be collected for printing the bar code.

Defines an alpha-numeric name up to 16 characters long. This name must be unique within a pageformat.

BCDSEQ *seq#*

Specifies Bar code data sequence number. Allows for sequencing bar code data. Bar code data collected with unique sequence numbers will be collected in ascending order of their sequence number. Data with the same sequence number will be collected in the order their **FIELD** commands are processed.

Note: **BCDSEQ** is optional but if it coded, all bar codes with the same **BCDSYMB** symbol name must code **BCDSEQ**.

BCDNEW

Specifies to start a new bar code symbol for collected bar code data when this record is reused. If **BCDSEQ** is used to sequence the collection data, **BCDNEW** is placed on the **FIELD** command for the first record encountered in the data. This record might not be the first sequentially. In general, **BCDNEW** is placed on the record for the first piece of data encountered in the bar code data collection. If **BCDSYMB** is not specified, **BCDNEW** will be ignored.

Note: This parameter has no effect on a **PRINTLINE FIELD BARCODE** command as the **BCDNEW** function does not apply to traditional line data.

FONT Command

FONT Command (Traditional and Record Format)

```
                                                                  ┌─SBCS─┐
►►──FONT──┬─┬───────┬─cfname──────────────────────────────────┬─┼──────┼────────►
          │ └─lname─┘                                         │ └─DBCS─┘
          ├─lname──'cfname'───────────────────────────────────┤
          ├─lname──CS──character set name──CP──code page name─┤
          └─lname──GRID──hex grid─────────────────────────────┘

►──┬──────────────────────────┬─┤ TYPE ├─┬──────────────────┬───────────────────►
   │             ┌─POINTS─┐   │          └─RATIO──percent───┘
   └─HEIGHT──n───┼────────┼───┘
                 ├─IN─────┤
                 ├─CM─────┤
                 ├─MM─────┤
                 └─PELS───┘

   ┌─ROTATION──0────────┐
►──┼────────────────────┼─┬─────────────────────────────────────────────┬─;─────►◄
   └─ROTATION──┬─90──┬──┘ └─RES──┬─240─┬─┬────────────────────────────┬─┘
               ├─180─┤           └─300─┘ └─METTECH──┬─FIXED────┬──────┘
               └─270─┘                              └─RELATIVE─┘
```

TYPE (Traditional and Record Format):

```
   ┌─TYPE──EBCDIC─────────┐
├──┼──────────────────────┼──────────────────────────────────────────────────┤
   └─TYPE──┬─ASCII───┬────┘
           └─UNICODE─┘
```

TYPE (XML):

```
├──TYPE──┬─EBCDIC──┬─────────────────────────────────────────────────────────┤
         ├─ASCII───┤
         └─UNICODE─┘
```

The **FONT** command is used to identify the fonts that are to be specified with the following commands:

- **Traditonal: PRINTLINE**, **FIELD**, and **TRCREF** commands.
- **Record Layout: LAYOUT** and **FIELD** commands.
- **XML: XLAYOUT** and **FIELD** commands.

A maximum of 127 font names for each page definition can be identified.

Note: Naming a font with the **FONT** command does not, by itself, affect your output. You must specify the font in one of the commands listed abovefor the font to become effective. You must name at least one font in a Record Format or XML page definition.

FONT commands immediately follow the **PAGEDEF** command. A separate **FONT** command is required:

- For each font used within a page definition

- For each rotation of the same font

Note: For Traditional, see the **TRCREF** command for the exception.

FONT

```
├──FONT──┬─┬───────┬─cfname────────────────────────────────┬──────────┤
         │ └─lname─┘                                        │
         ├─lname──'cfname'──────────────────────────────────┤
         ├─lname──CS──character set name──CP──code page name─┤
         └─lname──GRID──hex grid─────────────────────────────┘
```

Identifies the fonts to be specified in the commands listed above.

lname
Local name for the font. Specifies an unquoted alphanumeric name of 1 to 16 characters (local name) of the font to be used in this page definition. The name must conform to the token rules and must be unique within this page definition.

lname is used with the following commands:
- **Traditonal: PRINTLINE**, **FIELD**, and **TRCREF** commands.
- **Record Layout: LAYOUT** and **FIELD** commands.
- **XML: XLAYOUT** and **FIELD** commands.

of a page definition.

lname is optional if *cfname* is specified.

cfname
Coded font name. Specifies an alphanumeric name of 1 to 6 characters (user-access name) of the coded font to be used in this page definition. Specify this name without the X*n* prefix.

'*cfname***'**
Quoted full user-access name. Specifies a quoted alphanumeric name of 1 to 8 characters of the coded font to be used in this page definition. The name can contain blanks and special characters. No upper case folding or prefix is added to the name. The '*cfname*' variable is intended for outline fonts and allows them to be selected without overriding the **HEIGHT** specified in the CFI structured field in the coded font. Enter the full outline font name as a quoted name and do not enter the **HEIGHT** parameter. For example, if you enter:

```
FONT myfont 'XZM32F'
```

the outline font XZM32F is used with no overriding **HEIGHT** parameters.

Notes:

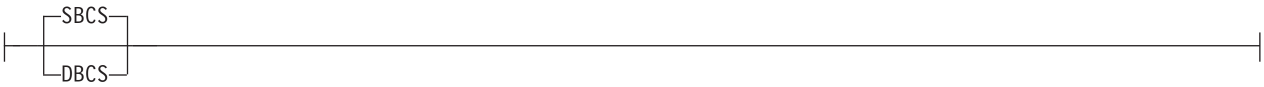
1. The quoted name of the font name is primarily intended for outline fonts. If you use a quoted name for a raster font, you must be sure that you have the name corresponding to the correct rotation of the font.

2. If you use the quoted name of the font name, you must also enter an *lname* (local name); sometimes called an “alias name”.
3. You can still specify the **HEIGHT** command if you want and override the coded font height.

character-set-name	Specifies an alphanumeric name of 1 to 6 characters of the character set to be used in this page definition. Specify this name without the C*n* prefix.
code-page-name	Specifies an alphanumeric name of 1 to 6 characters of the code page without the T1 prefix to be used in this page definition.
hex-grid	Specifies the 16-character hexadecimal **GRID**.

Subcommands

SBCS or DBCS



Specifies single-byte or double-byte fonts.

SBCS	Specifies that the font is a single-byte character set. This is the default.
DBCS	Specifies that the font is a double-byte character set.

HEIGHT *n*

Specifies the height of the outline font.

POINTS	Each point is equal to 1/72 of one inch.
IN	Inches
CM	Centimeters
MM	Millimeters
PELS	Pels in the current Logical Units per inch. For example in 240ths of an inch.

TYPE (Traditional and Record Format)

Traditional and Record Format:

```
   ┌─TYPE──EBCDIC────────┐
├──┼─────────────────────┼──────────────────────────────────────────┤
   └─TYPE──┬─ASCII───┬───┘
           └─UNICODE─┘
```

The **TYPE** subcommand indicates the type of font being used.

EBCDIC	This parameter is normally used for fonts on OS390–based systems. This is the default.
ASCII	This parameter is normally used for fonts on workstation–based systems.
UNICODE	This parameter is used with Unicode type fonts.

TYPE (XML only)

XML only:

```
├──TYPE──┬─EBCDIC──┬──────────────────────────────────────────────┤
         ├─ASCII───┤
         └─UNICODE─┘
```

The **TYPE** subcommand indicates the type of Font being used. This parameter is required for fonts in an XML page definition.

EBCDIC	This parameter is normally used for fonts on OS390–based systems.
ASCII	This parameter is normally used for fonts on workstation–based systems.
UNICODE	This parameter is used with Unicode type fonts (fixed two-byte **UNICODE** without surrogates.

Note: **TYPE** indicates what type of font is being used, OS390 or workstation, for the printing of **PRINTLINE**, **LAYOUT** or **XLAYOUT** commands. **UDTYPE** (on the **PAGEDEF**) is the user's data type (EBCDIC, ASCII, UTF8, UTF16) that is being placed with the font. The font **TYPE** and user data **UDTYPE** should match but certain combinations of **TYPE** and **UDTYPE** are permitted.

- Data is UTF-8 and Font is **ASCII** or **UNICODE**
- Data is UTF-16 and Font is **UNICODE**

Otherwise, message **AKQ271E** results.

RATIO

```
├──┬───────────────────┬──────────────────────────────────────────┤
   └─RATIO──percent────┘
```

Specifies the ratio of scaling the width relative to the height in an outline font.

percent	Represents the percent of the "normal" width of the character that is printed. For example, specifying **RATIO 50** yields a font with characters half as wide as normal, and specifying **RATIO 200**

yields a font with characters twice as wide (200% as wide) as normal. If **RATIO** is specified, you must also specify the **HEIGHT**.

ROTATION

```
   ┌─ROTATION──0────────┐
├──┤                    ├──────────────────────────────────────────────────────────┤
   └─ROTATION──┬─90──┬──┘
               ├─180─┤
               └─270─┘
```

Specifies the rotation of characters in degrees. The specified value is relative to the inline direction of a printline or field. Valid rotations are **0°**, **90°**, **180°**, or **270°**; **0°** is the default.

RESOLUTION

```
├──┬───────────────────────────────────────────┬──────────────────────────────────┤
   └─RES──┬─240─┬──┬──────────────────────────┬┘
          └─300─┘  └─METTECH──┬─FIXED────┬───┘
                              └─RELATIVE─┘
```

Specifies the resolution and metric technology on a font. Examples of resolution command inputs are:

RES or RESOLUTION

The raster-pattern resolution units in pels per inch

`240`	`240 pels per inch`
`300`	`300 pels per inch`

METTECH or METRICTECHNOLOGY

The metric technology used for this raster font

`FIXED`	`Fixed-metric technology`
`RELATIVE`	`Relative-metric technology`

Notes:

1. The resolution and metrictechnology subcommands allow rigorous font specifications for use with font fidelity. See the font fidelity subcommand **FONTFID** on the **FORMDEF** command.
2. For a description of metric technologies, refer to:
   - *Intelligent Printer Data Stream Reference*, S544-3417
   - *Font Object Content Architecture Reference*, S544-3285
3. **RESOLUTION** can be abbreviated as **RES**; **METRICTECHNOLOGY** can be abbreviated as **METTECH**.

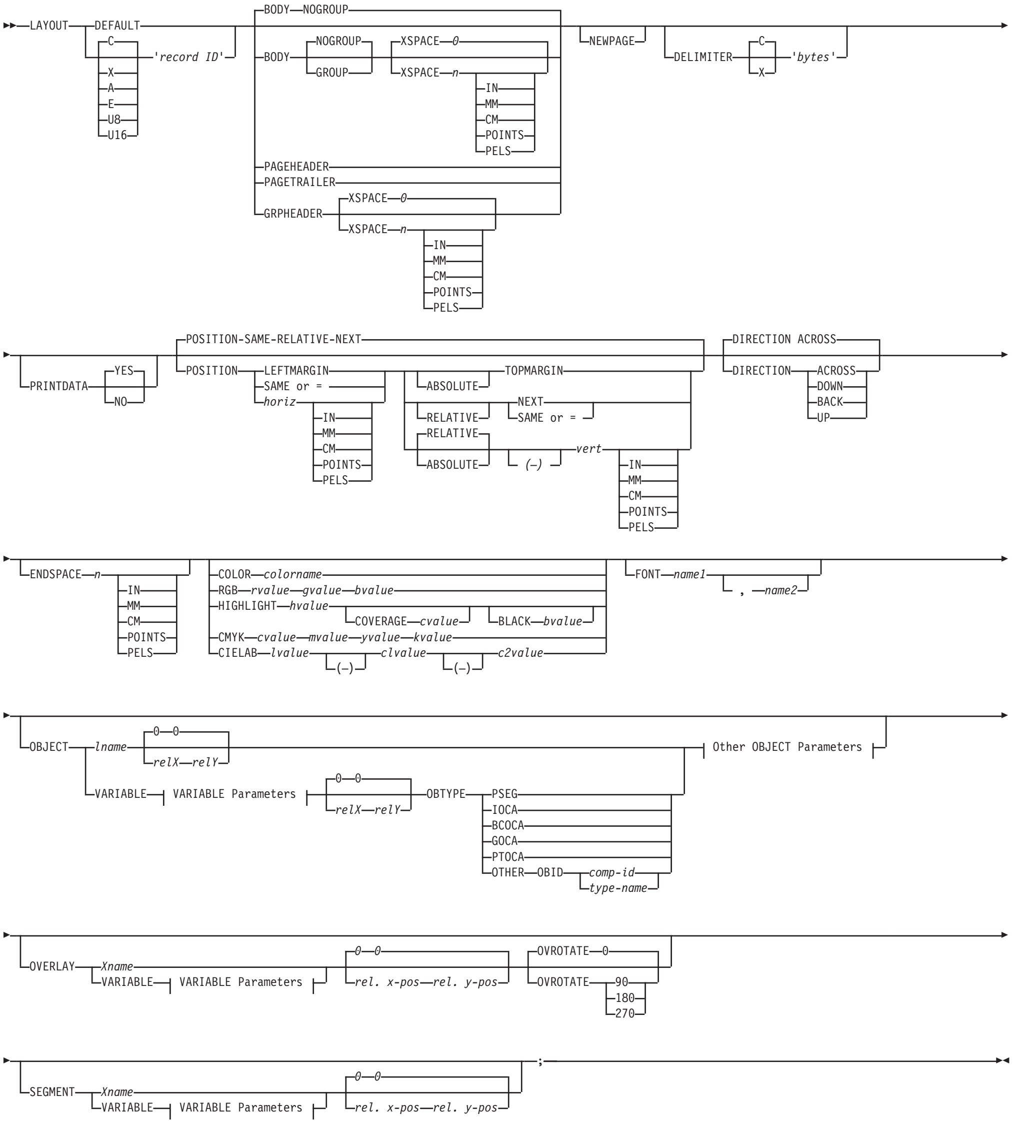
```
FORMDEF  xmp01
  FONTFID  YES ;

  PAGEDEF  xmp01    replace  yes ;
    FONT  xx2  res  240  mettech  fixed ;
    PRINTLINE  font  xx2 ;
```

Figure 114. Example of PPFA Support for Font Fidelity

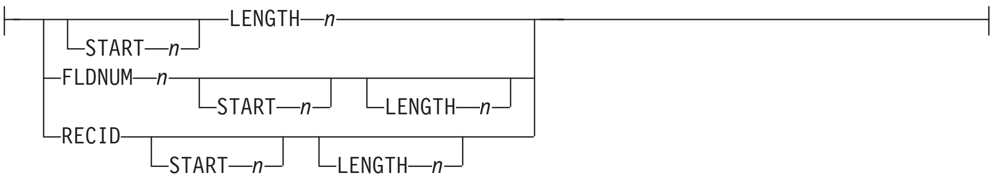
In Figure 114, the form definition `xmp01` specifies font fidelity and the page definition specifies a font that has 240 pels per inch resolution and fixed-metric technology. If a font with exactly those characteristics is not accessible by the printer, an error occurs and processing stops.

LAYOUT Command (Record Format)

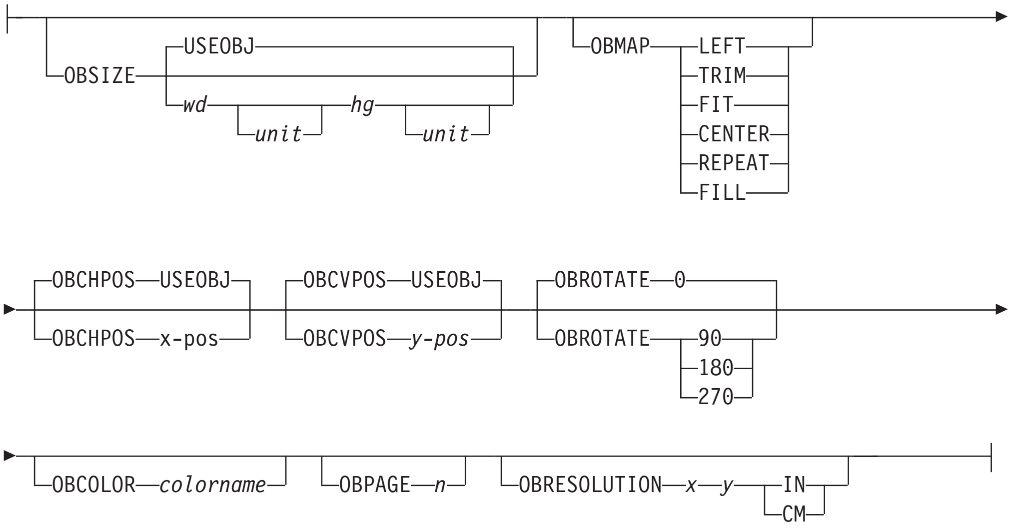
LAYOUT Command (Record Format)



VARIABLE Parameters:



Other OBJECT Parameters:



The **LAYOUT** command is used to format a data record. The **LAYOUT** command is associated with the line of data record using a “record ID” that appears both on the **LAYOUT** command and in the first *n* bytes of the data record (normally *n* is 10 bytes, but can be specified to be 1 to 250 bytes). The 'record ID' is entered in quotes and must match the 'record ID' within the data exactly, byte for byte. The ID is padded with blanks if the field is entered with less than *n* bytes.

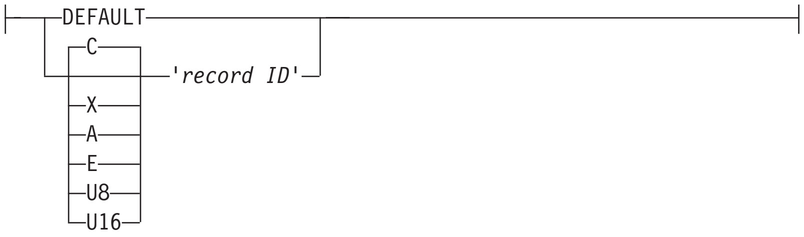
The **LAYOUT** command is used in a different type of page definition, a Record Format page definition. The **LAYOUT** command is analogous to the **PRINTLINE** and **XLAYOUT** commands in Traditional page definitions and XML page definitions.

Notes:

1. The **LAYOUT** command defines a “Record Format” page definition and cannot be mixed with **PRINTLINE** commands which define “Traditional” page definitions or **XLAYOUT** commands which define “XML” page definitions.
2. Normally the “record ID” is 10 bytes long, however, it can be specified to be 1 to 250 bytes by using the **RECIDLEN** subcommand on either the **PAGEDEF** or **PAGEFORMAT** commands

Subcommands

DEFAULT



This 'record ID' is used only when the layout type is either **PAGEHEADER** or **PAGETRAILER** and no name is needed.

'*record ID***'**
The '*record ID*' is a quoted name up to 250 characters long that is accepted as is with no case folding or translation.

C'*record ID***'**
The C'*record ID*' is a quoted name with a C for Character that are treated the same as a quoted name up to 250 characters. No folding or translation is done.

A'*record ID***'**
The A'*record ID*' is a quoted name with an A for ASCII entered with up to 250 single-byte characters that are accepted as-is if on an ASCII platform or translated to ASCII if on an EBCDIC platform. The translation is made with no case folding.

E'*record ID***'**
The E'*record ID*' is a quoted name with an E for EBCDIC entered with up to 250 single-byte characters that are accepted as-is if on an EBCDIC platform or translated to EBCDIC if on an ASCII platform. The translation is made with no case folding.

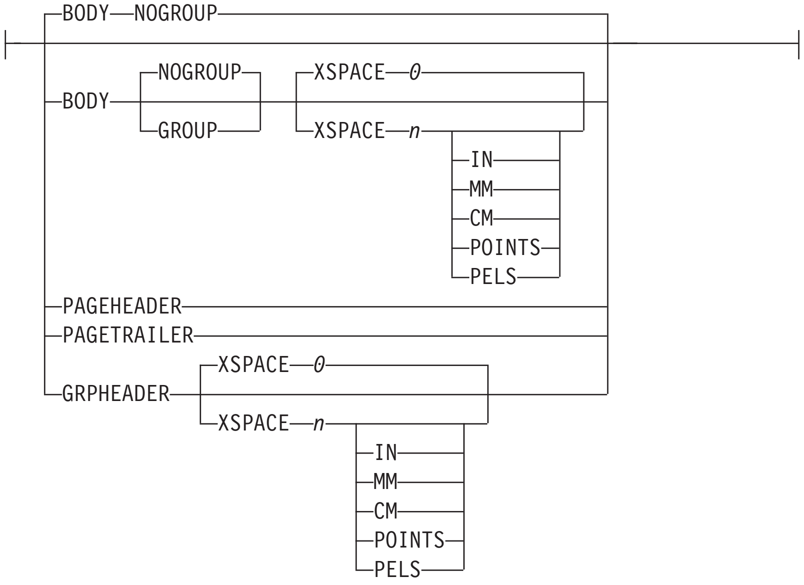
X'hhhh'
The X'hhhh' is a quoted name with an X for Hexadecimal entered with up to 500 hexadecimal characters. The characters are translated to hexadecimal, but no assumption of data type will be made.

Note: The values of all X'00' and all X'FF's are considered reserved and should not be used to specify the hexadecimal name value.

U8'*record ID***'**
The U8'*record ID*' is a quoted name with a U8 for UTF-8 entered with up to 250 single-byte characters that are translated to UTF-8.

U16'*record ID***'**
The U16'*record ID*' is a quoted name with a U16 for UTF-16 entered with up to 125 single-byte characters that are translated to UTF-16.

BODY



The **BODY** layout type is used for the majority of data in the user's database, normally printed line by line. This is the default.

GROUP
The **GROUP** parameter indicates that the existing group header should be saved and used for subsequent pages. If this parameter is not set when processing starts on a **BODY** layout, the active group header record is discarded and not reprinted on subsequent pages.

PAGEHEADER
This layout type specifies a header that is to be printed on each new page. The baseline position of this layout is normally in the top margin, but can be anywhere on a logical page. If **RELATIVE** is specified, the position is considered to be relative to the page origin. Usually contains customer's name, address, account number, and so forth. Only one default **PAGEHEADER** layout can be specified in a **PAGEFORMAT** and no input record data can be specified in a default layout.

GRPHEADER This layout type specifies a header that is to be printed at the beginning of a group of data. If a logical page eject occurs before the group of data ends, the header is printed after the top margin on each new page until the group ends. The baseline position of this layout can be specified as **RELATIVE**. It may include column headings.

XSPACE **XSPACE** indicates the amount of extra space from the position of the layout to the bottom of the group header area. This allows the user to identify the amount of eXtra space in excess of one text line being used by the header so that the baseline moves down and the following group data is not placed on top of the header area. This space is not calculated by PPFA and must be explicitly defined by the user. See example below (shaded space shows group header area):

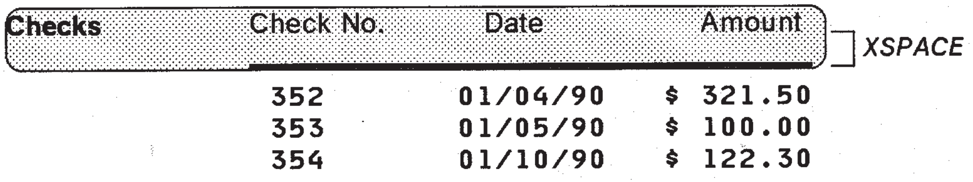


Figure 115. Example Showing the Use of **XSPACE**.

Once a Group Header record is processed and is still active when leaving the **PAGEFORMAT**, the group header record is saved by the presentation services program. Whenever the same **PAGEFORMAT** is re-invoked, this saved group header record is presented again if the first body record after re-invoking the **PAGEFORMAT** selects a Body record that has the Group Indicator on.

PAGETRAILER

This layout type specifies a trailer that is to be printed on each new page. The baseline position of this layout is normally in the bottom margin, but can be located anywhere on a logical page and can be specified as **RELATIVE**. Only one default **PAGETRAILER** layout can be specified in a **PAGEFORMAT** and no input record data is processed with a default layout. It may contain the name of the form or a footnote.

NEWPAGE

```
├──┬─────────┬──────────────────────────────────────────┤
   └─NEWPAGE─┘
```

This parameter indicates that a new page should be started with this layout name. If this is a header or trailer layout, the print position is moved to the start of a new page before this header or trailer becomes the active header or trailer.

DELIMITER

```
├──┬───────────────────────────────┬────────────────────┤
   │              ┌─C─┐            │
   └─DELIMITER────┼───┼──'bytes'───┘
                  └─X─┘
```

The delimiter is a one or two byte code specified in either character or hex indicates a delimiting character within the customer's database and is used to separate fields. PPFA translates the character data to the data type specified by the **UDType** subcommand on the **PAGEDEF** command. Hex characters must be entered in uppercase within the quotation marks and are not translated.

Notes:

1. Delimiters specified after the Record ID are ignored.
2. You cannot mix delimited and non-delimited fields on the same **LAYOUT** command.
3. A single-byte delimeter character is ignored when processing EBCDIC double byte text (SOSI).

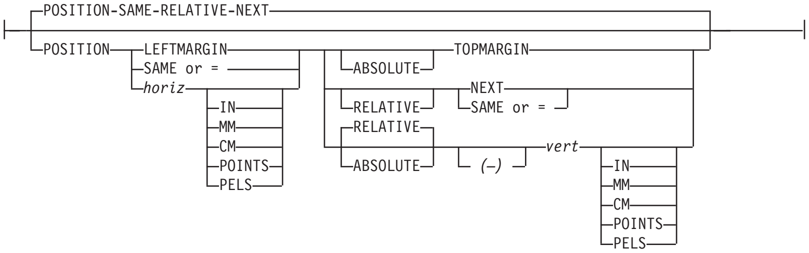
PRINTDATA

Specifies whether the line of data associated with the current **LAYOUT** should be printed. The **PRINTDATA** subcommand is useful when the data stream is interspersed with lines of comments, blank lines, or lines without data that are not meant to be printed.

YES Specifies the data for the current **LAYOUT** is printed. **YES** is the default.

NO Specifies the data for the current **LAYOUT** is not printed.

POSITION



This is for use in positioning **FIELD**, **DRAWGRAPHIC**, and **ENDGRAPHIC** text and graphics. If **RELATIVE** is specified or **POSITION** is not specified, the baseline of the **POSITION** is relative to the previous **LAYOUT** position.

1. For **PAGEHEADER** RCD: The baseline position can be anywhere on a logical page, but cannot be specified as Relative.
2. For **PAGETRAILER**, **GROUPHEADER** and **BODY** RCDs: The baseline position can be anywhere on a logical page and can be specified as **RELATIVE**.

Specifies the starting position of the layout in the printout.

horizontal position

x-pos Specifies the horizontal offset from the left side of the logical page. The value is a number with up to three decimal places. The valid options for *x-pos* are described in the **SETUNITS** command for the horizontal value.

LEFTMARGIN

Specifies this line starts at the position specified as the horizontal (*x*) value in the previous **LEFTMARGIN** subcommand within this page definition.

SAME Specifies this line starts at the same horizontal offset position as the previously coded **LAYOUT**. If applied to the first **LAYOUT** of a logical page, the horizontal position is 0, which is the default.

=	Alternate for **SAME**.

RELATIVE

Specifies that the following vertical position value is to be processed as a relative value. The **LAYOUT** is positioned relative to the last **LAYOUT** placed on the page.

Note: If both TOP and RELATIVE are requested for the *y-pos* value, the **RELATIVE** request is ignored.

When using **RELATIVE** positioning, PPFA does not flag off-the-page conditions for the position of a **LAYOUT** or for any overlays, segments or objects placed relative to that **LAYOUT**. **LAYOUT**s that fall outside the bounds of the logical page are flagged by the print server at run time.

When specifying **RELATIVE**, use the minus sign to indicate any negative values for the **LAYOUT** vertical position; you may use the plus sign to indicate positive values. If no sign is used, a positive value is assumed.

The **DIRECTION** for a relative **LAYOUT** must be **ACROSS**. Fields associated with a relative **LAYOUT** must have the same **DIRECTION** as the **LAYOUT** and must match the **PAGEFORMAT DIRECTION**.

If **RELATIVE** is specified with "**SAME**" or "=" as the "*y*" value, the relative value in the **LAYOUT** is +0.

RELATIVE positioning is allowed on a **LAYOUT** command only if the **LAYOUT** and all its associated **FIELD** commands are formatted to print in the same direction as the **PAGEFORMAT**. That is, the **DIRECTION** parameter in the **LAYOUT** and any associated **FIELD** commands must specify (or default to) **ACROSS**. The **DIRECTION** in the **PAGEFORMAT** or **PAGEDEF** command may be any allowable value: **ACROSS**, **DOWN**, **BACK**, or **UP**.

vertical position

y-pos	Specifies the vertical offset from the top side of the logical page. The value options for *y-pos* are described in the **SETUNITS** command for the vertical value.
TOPMARGIN	Specifies that the **LAYOUT** is placed in the position specified as the vertical (*y*) value in the **TOPMARGIN** subcommand within this page definition.
NEXT	Specifies the layout is to be positioned down (on the logical page) one line (as defined in the **LINESP** subcommand of the

last **SETUNITS** command) from the previews **LAYOUT**. The **LINESP** subcommand of the **SETUNITS** command establishes the distance from one line to the next.

When <u>**NEXT**</u> is specified for the first **LAYOUT** of a logical page, the starting position of the line is one line down from the top of the logical page, as defined by the **TOPMARGIN** subcommand.

Note: The "down" direction is determined by the direction of the logical page (as specified in the page format), not the **LAYOUT** direction. <u>**NEXT**</u> is, therefore, mainly useful in **ACROSS** **LAYOUT**s.

SAME Specifies this **LAYOUT** starts at the same vertical position as the previous **LAYOUT**.

= Alternate for SAME.

DIRECTION

```
  ┌─DIRECTION──ACROSS──────┐
├─┼────────────────────────┼──────────────────────────────────────────┤
  └─DIRECTION──┬─ACROSS─┬──┘
               ├─DOWN───┤
               ├─BACK───┤
               └─UP─────┘
```

Specifies the print direction of the line relative to the upper-left corner as you view the logical page. Not all printers can print in all print directions. For more information about your printer, refer to your printer documentation.

If **DIRECTION** is not specified, the direction specified in the **PAGEFORMAT** command is used. Observe that this direction is additive to the direction specified in the **PAGEFORMAT** command. See "PAGEFORMAT Command" on page 456.

<u>**ACROSS**</u> The layout direction is rotated 0 degrees relative to the direction specified in the **PAGEFORMAT** (the layouts are oriented in the same direction as the page).

DOWN The layout direction is rotated 90 degrees relative to the direction specified in the **PAGEFORMAT**.

BACK The layout direction is rotated 180 degrees relative to the direction specified in the **PAGEFORMAT**.

UP The layout direction is rotated 270 degrees relative to the direction specified in the **PAGEFORMAT**.

ENDSPACE

```
├──┬──────────────────────┬──────────────────────────────────┤
   └─ENDSPACE─n─┬────────┬┘
                ├─IN─────┤
                ├─MM─────┤
                ├─CM─────┤
                ├─POINTS─┤
                └─PELS───┘
```

If the remaining body space is less than the value specified, **ENDSPACE** causes a logical page eject to be executed. This can be used, for example, on a **GRPHEADER** layout to ensure that a group header does not print at the end of a page without the first data record of the group. **ENDSPACE** does not include the space within the bottom margin (specified on the **PAGEDEF** or **PAGEFORMAT** command). This indicator is ignored on a **PAGEHEADER** or **PAGETRAILER** layout.

COLOR Specifies an **OCA** or defined color for the text of this field. This subcommand is recognized only by printers that support multiple-color printing. Refer to your printer publication for information about the colors that can printed.

```
├──┬─COLOR─colorname───────────────────────────────────────────────┬──┤
   ├─RGB─rvalue─gvalue─bvalue──────────────────────────────────────┤
   ├─HIGHLIGHT─hvalue─┬─────────────────────┬─┬───────────────┬────┤
   │                  └─COVERAGE─cvalue─────┘ └─BLACK─bvalue──┘    │
   ├─CMYK─cvalue─mvalue─yvalue─kvalue──────────────────────────────┤
   └─CIELAB─lvalue─┬─────┬─clvalue─┬─────┬─c2value─────────────────┘
                   └─(–)─┘         └─(–)─┘
```

colorname Values for *colorname* can be a defined color (see “DEFINE COLOR Command” on page 313), or an OCA *colorname*. Values for OCA *colornames* are:

NONE
DEFAULT
BLACK
BLUE
BROWN
GREEN
RED
PINK (or **MAGENTA**)
TURQ (or **CYAN**)
YELLOW
DARKBLUE (or **DBLUE**)
ORANGE
PURPLE
MUSTARD
GRAY
DARKGREEN (or **DGREEN**)
DARKTURQ (**DTURQ**, or **DCYAN**, or **DARKCYAN**)

The color choices depend on the printer.

If you do not enter one of these colors, the default color for that printer is used. **NONE** is the color of the medium, **DEFAULT** is the printer default color.

Note: In some printer manuals, the color turquoise (**TURQ**) is called “cyan”, and the color pink (**PINK**) is called “magenta”.

PPFA supports the following synonyms:
- **CYAN** for **TURQ**
- **DARKCYAN** for **DARKTURQ**
- **DBLUE** for **DARKBLUE**
- **DCYAN** for **DARKTURQ**
- **DGREEN** for **DARKGREEN**
- **DTURQ** for **DARKTURQ**
- **MAGENTA** for **PINK**

Color Models

Specifies the color of print for this field supported in MO:DCA for the Red/Green/Blue color model (**RGB**), the highlight color space, the Cyan/Magenta/Yellow/Black color model (**CMYK**), and the **CIELAB** color model.

RGB *rvalue gvalue bvalue*

Three **RGB** integer values are used. The first (*rvalue*) represents a value for red, the second (*gvalue*) represents a value for green, and the third (*bvalue*) represents a value for blue. Each of the three integer values may be specified as a percentage from 0 to 100.

Note: An **RGB** specification of 0/0/0 is black. An **RGB** specification of 100/100/100 is white. Any other value is a color somewhere between black and white, depending on the output device.

HIGHLIGHT *hvalue* **COVERAGE** *cvalue* **BLACK** *bvalue*

Indicates the highlight color model. Highlight colors are device dependent.

You can use an integer within the range of 0 to 65535 for the *hvalue*.

Note: An *hvalue* of 0 indicates that there is no default value defined; therefore, the default color of the presentation device is used.

COVERAGE indicates the amount of coverage of the highlight color to be used. You can use an integer within the range of 0 to 100 for the *cvalue*. If less than 100 percent is specified, the remaining coverage is achieved with the color of the medium.

Note: Fractional values are ignored. If **COVERAGE** is not specified, a value of 100 is used as a default.

BLACK indicates the percentage of black to be added to the highlight color. You can use an integer within the range of 0 to 100 for the *bvalue*. The amount of black shading applied depends on the **COVERAGE** percentage, which is applied first. If less than 100 percent is specified, the remaining coverage is achieved with black.

Note: If **BLACK** is not specified, a value of 0 is used as a default.

CMYK *cvalue mvalue yvalue kvalue*

Defines the cyan/magenta/yellow/black color model. *Cvalue* specifies the cyan value. *Mvalue* specifies the magenta value. *Yvalue* specifies the yellow value. *Kvalue* specifies the black value. You can use an integer percentage within the range of 0 to 100 for any of the **CMYK** values.

CIELAB *Lvalue* **(–)***c1value* **(–)***c2value*

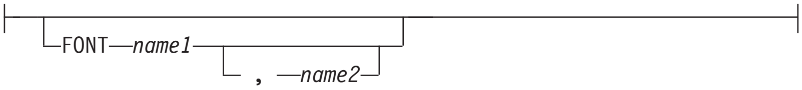
Defines the **CIELAB** model. Use a range of 0.00 to 100.00 with *Lvalue* to specify the luminance value. Use signed integers from −127 to 127 with *c1value* and *c2value* to specify the chrominance differences.

Lvalue, *c1value*, *c2value* must be specified in this order. There are no defaults for the subvalues.

Note: Do not specify both an **OCA** color with the **COLOR** sub-parameter and an extended color model on the same **FIELD** or **PRINTLINE** command. The output is device dependent and may not be what you expect.

Do not specify two extended **COLOR** subcommands on the same **FIELD** or **PRINTLINE** command.

FONT



Defines the font to be used for the layout.

name1

Specifies the name of a font used to print the data. This font must have been defined in a previous **FONT** command in this page definition.

If Shift-Out, Shift-In (SOSI) processing is used, *name1* must be the single-byte font.

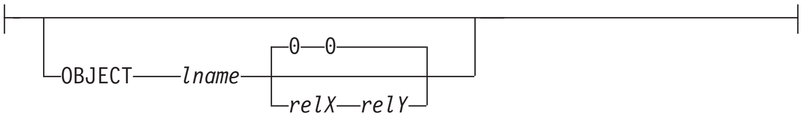
name2

Specify only when using Shift-Out, Shift-In (SOSI) processing to dynamically switch between a single-byte font and a double-byte font within the layout. *name2* must be the double-byte font.

Notes:

1. If this subcommand is not specified in the print data, the print server uses the font indicated. Otherwise, the print server selects a default font.
2. *name2* is only valid with EBCDIC data.

OBJECT *parameters*



Specifies the name of an object that is to be positioned and oriented relative to the location specified in the **LAYOUT** command in which the **OBJECT** subcommand was named. The **OBJECT**, as identified by the *lname* parameter, must have been defined by an **OBJECT** command.

Note: Multiple page/image objects used without specifying a page using **OBPAGE** will default to using the first page in the object.

You may place multiple objects on the same **LAYOUT** command and you may place the same object multiple times. Each placement must have its own set of placement parameters, as follows:

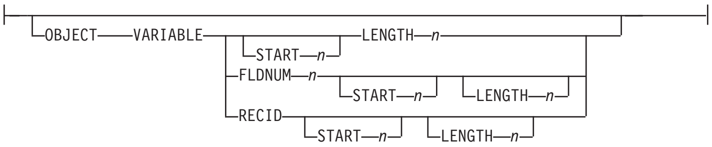
lname Specifies the local name of an object that is up to 16 alphanumeric characters in length. The *lname* is used to match the **LAYOUT OBJECT** subcommand to its definition from the **OBJECT** command. An object must be defined with this local name by the **OBJECT** command.

relative-xpos relative-ypos

Specifies the number of units (inches, mm, and so on) that are added to the position of the current **LAYOUT** to position the top-left corner of the object. The values for the horizontal and vertical positioning are limited by the type of printer used and the L-units specified with the **PELSPERINCH** parameter on the **PAGEDEF** or **PAGEFORMAT** command.

Each position specification can be a positive or negative number with up to three decimal places. The units specified can be one of the following: **IN**, **MM**, **CM**, **POINTS**, or **PELS**.

VARIABLE



Indicates that the actual name of the object is read from the data record. The **Variable-Name-Locator** field specifies where in the data to get the name.

Notes:

1. Any object that is to be included in this manner should be defined in the **PAGEDEF** using the **OBJECT** command. Defining objects will enhance performance.
2. If you specify **VARIABLE** for the **OBJECT** name and don't want to print the name, then you must have at least one field command, or code **PRINTDATA NO** on the **LAYOUT** command.

START *n* The starting position in the data record to get the overlay name. The first data byte position of the input record is 1. If **START** is not coded, 1 is assumed.

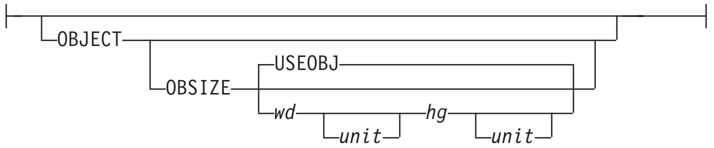
LENGTH *n* Length of field. Specifies the number (*n*) of bytes to process from the data record, beginning with the position specified in **START**. The maximum length is 8.

FLDNUM *n* **START** *n* **LENGTH** *n*

The field number. This is the same as in the **FIELD** command. The overlay name is

	taken from the *n* field of the input data record. **START** *n* and **LENGTH** *n* describe which portion of the *n* field is used. If omitted, the entire field is used to form the overlay name.
RECID	Gets the name from the record id. This is the same as in the **FIELD** command. Use **START** *n* and **LENGTH** *n* to use only a portion of the record id, or leave them out to use the entire record field.

OBSIZE



Specifies the size of the object placement area. When no **OBSIZE** is specified, the default is the size specified in the object. If no size is specified in the object, the size of the page is used. The page width is as specified on the **PAGEDEF** or **PAGEFORMAT** commands, or it defaults to 8.3 inches by 10.8 inches.

wd	Specifies the width of an object placement area as a number with up to three decimal places. The allowable width may vary with the type of printer used and the L-units specified with the **PELSPERINCH** parameter on the **PAGEDEF** or **PAGEFORMAT** command.
hg	Specifies the height of the object placement area as a number with up to three decimal places. The allowable height may vary with the type of printer used and the L-units specified with the **PELSPERINCH** parameter on the **PAGEDEF** or **PAGEFORMAT** command.
unit	Specifies a unit of measurement for the width parameter. The choices are: **IN**, **MM**, **CM**, **POINTS**, or **PELS**. **Note:** If no unit is specified, the default is the most recent **SETUNITS** command value or **IN** (inch) if a **SETUNITS** command has not been issued.
USEOBJ	Specifies that the size measurements specified in the object are to be used. If no size is specified in the object, the size of the page is used, which is the length and width as specified on the **PAGEDEF** or **PAGEFORMAT** commands, or it defaults to 8.3 inches by 10.8 inches.

OBMAP

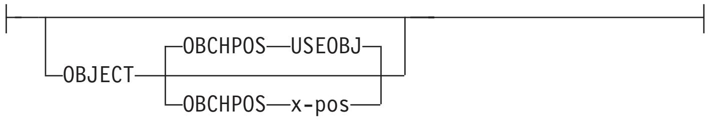
```
├──┬─────────────────────────────┬──────────────────────┤
   └─OBJECT──┬──────────────────┬┘
             └─OBMAP──┬─LEFT───┬┘
                      ├─TRIM───┤
                      ├─FIT────┤
                      ├─CENTER─┤
                      ├─REPEAT─┤
                      └─FILL───┘
```

Specifies mapping options. The **OBMAP** parameter defines the mapping of the object to the object placement area. If **OBMAP** is not coded, the mapping option within the object is used. If the object does not contain a mapping option, then the print server sets it to the created default for the container type.
Each object type (**OBTYPE** on the **OBJECT** command) dictates the allowable mapping options for that type. When it can, PPFA issues a message when these rules are violated. However, in the case of an object type of page segment (**OBTYPE=PSEG**), PPFA does not know what types of objects are contained in it; therefore, PPFA cannot enforce the restrictions. See "OBJECT Command" on page 423 for a description of the restrictions.

LEFT	Specifies that the object is positioned at the upper, left-hand corner of the object placement area, as defined or defaulted by the *relative-xpos*, *relative-ypos*, **OBCHPOS**, and **OBCVPOS** parameters. Any portion of the object that falls outside the object placement area as defined by the **OBSIZE** parameter is not trimmed and could cause an exception condition by the presentation system.
TRIM	Specifies position and trim. The object is positioned at the upper, left-hand corner of the object placement area, as defined or defaulted by the *relative-xpos*, *relative-ypos*, **OBCHPOS**, and **OBCVPOS** parameters. Any portion of the object that falls outside the object placement area as defined by the **OBSIZE** parameter is trimmed.
FIT	Specifies scale to fit; this is the default value if the **OBMAP** parameter is not coded. The object is to be scaled to fit within the object placement area, as defined by the **OBSIZE** parameter. The center of the object is placed in the center of the object placement area and the object is scaled up or down to fit the block. Scaling in the horizontal and vertical directions is symmetrical. The **FIT** parameter ensures that all of the data in the object is presented in the object

	placement area at the largest possible size. The object is not trimmed.
CENTER	Specifies that the center of the object be positioned at the center of the object placement area. Any portion of the object that falls outside the object placement area is trimmed.
REPEAT	Specifies that the origin of the data object be positioned with the origin of the object placement area. The object is then replicated in the X and Y directions. If the last replicated data does not fit in the object area, it is trimmed to fit.
FILL	Specifies that the center of the data object be positioned coincident with the center of the object placement area. The data object is then scaled, so that it totally fills the object placement area in both the X and Y directions. This may require that the object be asymmetrically scaled by different scale factors in the X and Y directions.

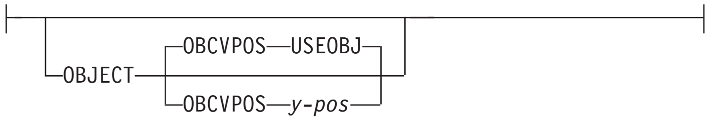
OBCHPOS



Specifies the horizontal offset of the object contents within the object placement area as a number.

x-pos	Specifies a positive or negative number. The valid options for *x-pos* are described in the **SETUNITS** command for the horizontal value.
USEOBJ	Specifies that the offset value from the object is to be used. If no value is set in the object, the value defaults to **0**.

OBCVPOS



Specifies the vertical offset of the object contents within the object placement area, as defined by the **OBSIZE** parameter. If **OBCVPOS** is not specified, it defaults to **USEOBJ** and uses the value set in the object. If no value is set in the object, the value defaults to **0**. The **OBCHPOS** parameter is used only in **LEFT** and **TRIM** mapping of the object into the object placement area.

y-pos	Specifies a positive or negative number.

The valid options for *y-pos* are described in the **SETUNITS** command for the vertical value.

USEOBJ
Specifies that the offset value from the object is to be used. If no value is set in the object, the value defaults to **0**.

OBROTATE {0|90|180|270}

```
├──┬────────────────────────────────┬──────────────────┤
   └─OBJECT─┬─OBROTATE──0─────────┬─┘
            └─OBROTATE──┬─90──┬───┘
                        ├─180─┤
                        └─270─┘
```

Specifies the object rotation with respect to the current LND's coordinate system.

OBCOLOR *colorname*

```
├──┬─────────────────────────────────┬──────────────────┤
   └─OBJECT─┬──────────────────────┬─┘
            └─OBCOLOR──colorname───┘
```

Specifies the color to be used as the default color or initial color for the object placement area. The **OBCOLOR** parameter is used only for objects of the **PSEG**, **GOCA**, **BCOCA**, and **IOCA** type. If the object type is **OTHER**, this parameter is ignored.

colorname
Values for *colorname* can be a defined color (see “DEFINE COLOR Command” on page 313) or one of the **OCA** color spaces listed below.

NONE
DEFAULT
BLACK
BLUE
BROWN
GREEN
RED
PINK (or **MAGENTA**)
TURQ (or **CYAN**)
YELLOW
DARKBLUE (or **DBLUE**)
ORANGE
PURPLE
MUSTARD
GRAY
DARKGREEN (or **DGREEN**)
DARKTURQ (**DTURQ**, or **DCYAN**, or **DARKCYAN**)

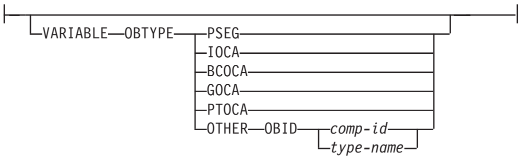
In the following example, the page definition pd1 has defined an object with an external name of “PSEGxyz”, of object type PSEG. The object has an internal name of “xyzintname”. The internal name identifies the object for the **LAYOUT OBJECT** subcommand when the object is placed. Observe that case is not significant on either the internal nor the external names.

```
PAGEDEF pd1 Replace Yes
  COMMENT 'this is my program';
  FONT XF1 ;

  OBJECT xyzIntName
    OBXNAME PSEGxyz
    OBTYPE  PSEG ;

PAGEFORMAT pf1;
  LAYOUT 'abc' POSITION 2 in  1 in;
    OBJECT xyzintname 1.1 in 2.1 in
    OBSIZE 3 in  5 in
     OBMAP FILL
     OBCOLOR BLUE ;
```

Figure 116. Example of PPFA Support for IOB in a **PAGEDEF**

The **LAYOUT** in **PAGEFORMAT** pf1 places the object on the page 1.1 inches to the left and 2.1 inches below the current **LAYOUT** position. It also maps the object into the object area with the **FILL** parameter, which centers the object in the object area and totally fills the area, possibly with different scaling factors in the X and Y directions. It has an area size of 3 by 5 inches, and overrides the default presentation space color to **BLUE**.

OBTYPE



Used to specify the type of the object. Observe that each of the object types restricts the type of mapping option allowed in the placement of the object (**OBMAP** on the **OBJECT** subcommand on the **PRINTLINE** command.)

PSEG Specifies a page segment object, as described in the *Mixed Object Document Content Architecture (MODCA) Reference Manual*. All mapping types (**OBMAP**) are allowed by PPFA, however, the print server issues an error if any of the objects contained in the page segment are not compatible with the coded **OBMAP** parameter.

GOCA
Specifies a graphic object, as described in the *Graphics Object Content Architecture (GOCA) Reference Manual*. **GOCA** allows you to specify **TRIM**, **FIT**, **CENTER**, **REPEAT**, and **FILL** parameters on the **OBMAP** subcommand.

BCOCA
Specifies a bar code object, as described in the *Bar Code Object Content Architecture (BCOCA) Reference Manual*. **BCOCA** allows you to specify only the **LEFT** parameter on the **OBMAP** subcommand.

IOCA Specifies an image object, as described in the *Image Object Content Architecture (BCOCA) Reference Manual*. **IOCA** allows you to specify **TRIM**, **FIT**, **CENTER**, **REPEAT**, and **FILL** parameters on the **OBMAP** subcommand.

PTOCA
Specifies a presentation text object with Object Environment Group (OEG) as described in the *Presentation Text Object Content Architecture (PTOCA) Reference Manual* and the *Mixed Object Document Content Architecture (MODCA) Reference Manual*. The **PTOCA** object type allows you to specify the **LEFT** parameter in the **OBMAP** subcommand.

OTHER
Specifies other object data. The object data to be included is a paginated presentation object with a format that may or may not be defined by an InfoPrint Solutions Company presentation architecture. When you specify **OTHER**, you must also specify the **OBID** parameter. **OTHER** allows you to specify **TRIM**, **FIT**, **CENTER**, **REPEAT**, and **FILL** parameters on the **OBMAP** subcommand.

OBID Specifies either a component identifier or a type name from Table 14 on page 418. The **OBID** is translated into an Encoded OID and matched to the OID inside the object; they must match.

component-id	Specifies the component identifier.
type-name	The name chosen by PPFA as an alternative to coding a component identifier.

Table 14. Non-OCA Objects supported by IOB

Type-Name	Component-id	Description of OBID Object Type
EPS	13	Encapsulated PostScript
TIFF or TIF	14	Tag Image File Format
WINDIB	17	Device Dependent Bit Map [DIB], Windows Version
OS2DIB	18	Device Dependent Bit Map [DIB], PM Version
PCX	19	Paint Brush Picture File Format
GIF	22	Graphics Interchange Format
JFIF, JPEG, or JPG	23	AFPC (AFP Consortium) JPEG Subset
PDFSPO	25	PDF Single Page Object
PCLPO	34	PCL Page Object
EPSTR	48	EPS with Transparency
PDFSPOTR	49	PDF Single Page Object with Transparency
MTIFF	61	TIFF Multiple Image File
MTIFFNT	62	TIFF Multiple Image without Transparency File
MPDF	63	PDF Multiple Page File
MPDFT	64	PDF Multiple Page with Transparency File
PNG	65	PNG File Format
AFPCTIFF	66	AFPC TIFF subset

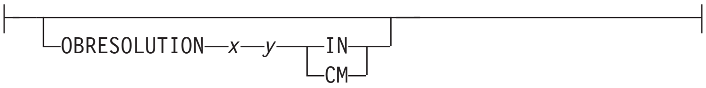
Table 15. Object Types that can be referenced as Secondary Resources

Type-Name	Component-id	Description of OID Type-Name
PDFRO	26	PDF Resource Object (new)
RESCLRPRO	46	Resident Color Profile Resource Object
IOCAFS45RO	47	IOCA FS45 Resource Object Tile (new)

OBPAGE

Specifies the page number of a multipage object or file to be presented. ***n*** is the page number. A number from 1 to 999999999 (9 digits) is valid.

OBRESOLUTION



Specifies the resolution and unit of measurement of an image. If the resolution is already specified inside the image, this information is ignored by the printer. Use this subcommand for images that do not or may not contain their resolution. Specify resolution of an image so that the printer can print the image correctly.

To specify object resolution, you must have a printer and a print server (PSF or IPM) that support this capability.

If not specified, the default is to assume that the image resolution is the same as the printer. If the image does not print at the size you expect, use **OBRESOLUTION** to identify the image's resolution. With the resolution information, the printer will then be able print the image at the expected size.

x-res	Specifies the number to be used for the horizontal resolution of an image. Specify an integer value in the range of 1-3276.
y-res	Specifies the number to be used for the vertical resolution of an image. Specify an integer value in the range of 1-3276.
unit	Specifies a unit of measurement. The choices are:

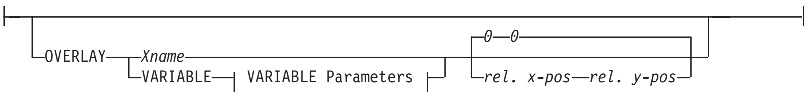
IN	Inch
CM	Centimeter

Code Example:

In the following example, the **OBJECT** subcommand is used to define a JFIF object (which may be specified as JPG). This object has a a resolution of 300 pels per inch in both the *x* and *y* directions.

```
Pagedef  obres2 replace yes;

 PRINTLINE  OBJECT VAR  .4 .5 start 2 length 6
            OBTYPE OTHER OBID JPG
            OBRESOLUTION 300 300 IN;
```

OVERLAY



Specifies the name of an overlay that is to be positioned relative to the location specified in the **LAYOUT** command in which the **OVERLAY** subcommand was named. The **PAGEFORMAT OVERLAY** command may contain the named overlays. The maximum number of overlays specified for a **PAGEFORMAT** including the **LAYOUT OVERLAY** subcommand is 254.

Specifies the electronic overlay that is to be used with this subgroup.

name Specifies the user-access name as defined in the **OVERLAY** command.

Notes:

1. PPFA checks for duplication of local names. If there is a duplication, the page definition is generated, but a warning message is issued.
2. PPFA does not check for duplicate user-access names.

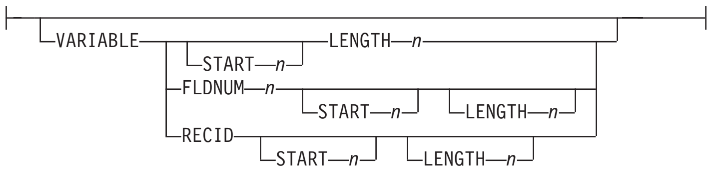
relative-xpos relative-ypos

Specifies the number of units (inches, mm, and so on) that are added to the position of the layout to position the top-left corner of the overlay. The values for horizontal and vertical may be (+) or (–). The maximum value is + or – 32760 L-units. For example:

- OVERLAY NAME1 2 in 1 in
- OVERLAY NAME2 5 mm 1 mm

Note: Any offset coded in the overlay itself is added to this offset.

VARIABLE



Indicates that the actual name of the overlay, including the O1 prefix, is read from the data record. The **Variable-Name-Locator** field specifies where in the data to get the name.

Notes:

1. Any overlay that is to be included in this manner must be defined in the **PAGEFORMAT** using the **OVERLAY** command. Any overlay included but not defined will cause a run time print error for a missing MPO structured field, for example APS263I.
2. If you specify **VARIABLE** for the **OVERLAY** name and don't want to print the name, then you must have at least one field command, or code **PRINTDATA NO** on the **LAYOUT** command.

START *n* The starting position in the data record to get the overlay name. The first data byte position of the input record is 1. If **START** is not coded, 1 is assumed.

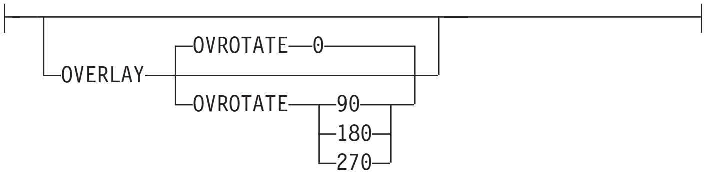
LENGTH *n* Length of field. Specifies the number (*n*) of bytes to process from the data record, beginning with the position specified in **START**. The maximum length is 8.

FLDNUM *n* **START** *n* **LENGTH** *n*

Field number (Record Layout and XML Page definitions only). This is the same as in the **FIELD** command. The overlay name is taken from the "n"th field of the input data record. **START** *n* and **LENGTH** *n* describe which portion of the "n"th field is used. If omitted, the entire field is used to form the overlay name.

RECID Get the name from the record id (Record Layout and XML page definitions only). This is the same as in the **FIELD** command. Use **START** *n* and **LENGTH** *n* to use only a portion of the record id, or leave them out to use the entire record field.

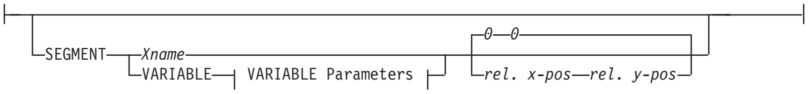
OVROTATE {0|90|180|270}



Specifies the rotation of the placed overlay with respect to the x-axis of the page.

See "FORMDEF Command" on page 257 for an **OVROTATE** example, which is presented in the **FORMDEF** description.

SEGMENT



Specifies the name of a segment that is to be positioned relative to the location specified in the **LAYOUT** command in which the **SEGMENT** subcommand was named. The **PAGEFORMAT SEGMENT** command may contain the named segments. The maximum number of segments specified for a **PAGEFORMAT** including the **LAYOUT SEGMENT** subcommand is 127. Specifies the page segment that is to be used with this subgroup.

name Specifies the user-access name as defined in the **SEGMENT** command.

Notes:

1. PPFA checks for duplication of local names. If there is a duplication, the page definition is generated, but a warning message is issued.
2. PPFA does not check for duplicate user-access names.

relative-xpos relative-ypos

Specifies the number of units (inches, mm, and so on) that are added to the position of the layout to position the top-left corner of the page segment. The values for horizontal and vertical may be (+) or (−). The maximum value is + or − 32760 L-units. For example:

- SEGMENT MYSEG1 2 in 1 in
- SEGMENT MYSEG1 5 mm 1 mm

VARIABLE

```
├──┬──────────────────────────────────────────────────────────┬──┤
   └─VARIABLE──┬─┬─────────┬─LENGTH─n──────────────────┬─┘
               │ └─START─n─┘                            │
               ├─FLDNUM─n─┬─────────┬─┬──────────┬─────┤
               │          └─START─n─┘ └─LENGTH─n─┘     │
               └─RECID─┬─────────┬─┬──────────┬────────┘
                       └─START─n─┘ └─LENGTH─n─┘
```

Indicates that the actual name of the segment, including the S1 prefix, is read from the data record. The **Variable-Name-Locator** field specifies where in the data to get the name.

Note: If you specify **VARIABLE** for the **SEGMENT** name and don't want to print the name, then you must have at least one field command, or code **PRINTDATA NO** on the **LAYOUT** command.

START *n*
The starting position in the data record to get the overlay name. The first data byte position of the input record is 1. If **START** is not coded, 1 is assumed.

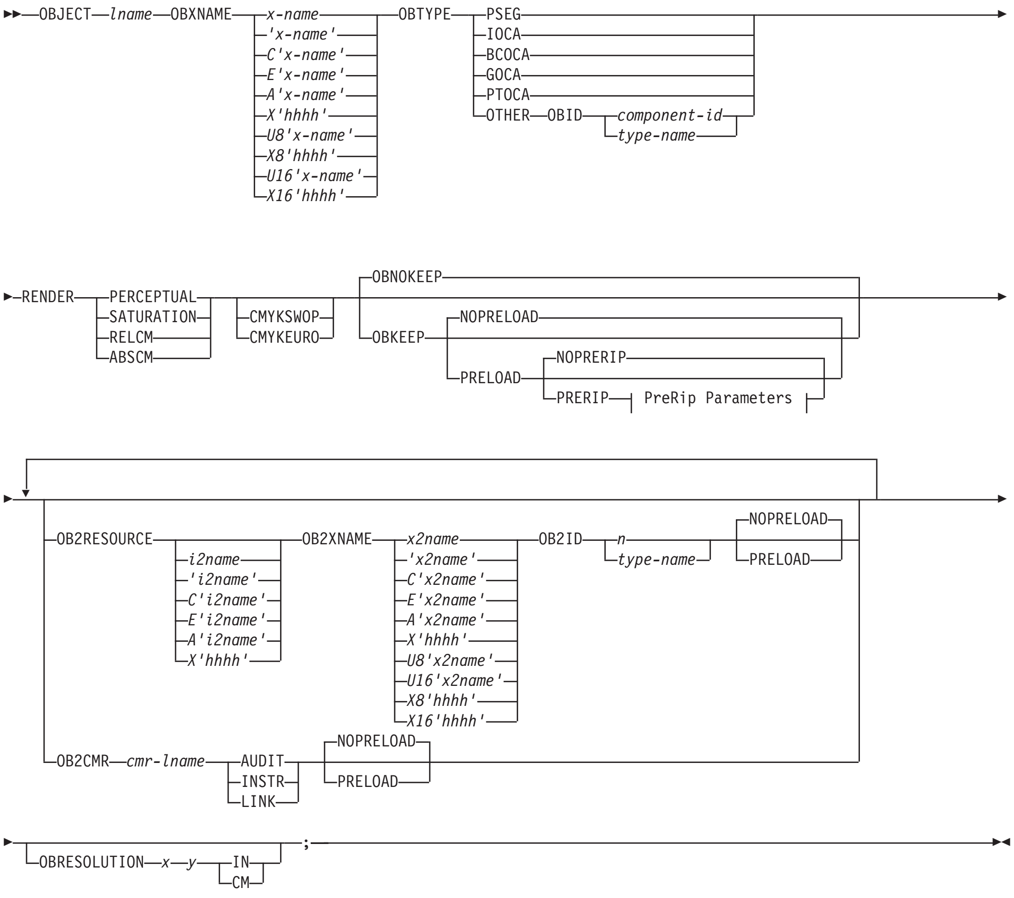
LENGTH *n*
Length of field. Specifies the number (*n*) of bytes to process from the data record, beginning with the position specified in **START**. The maximum length is 8.

FLDNUM *n* **START** *n* **LENGTH** *n*
Field number (Record Layout and XML Page definitions only). This is the same as in the **FIELD** command. The overlay name is taken from the "n"th field of the input data record. **START** *n* and **LENGTH** *n* describe which portion of the "n"th field is used. If omitted, the entire field is used to form the overlay name.

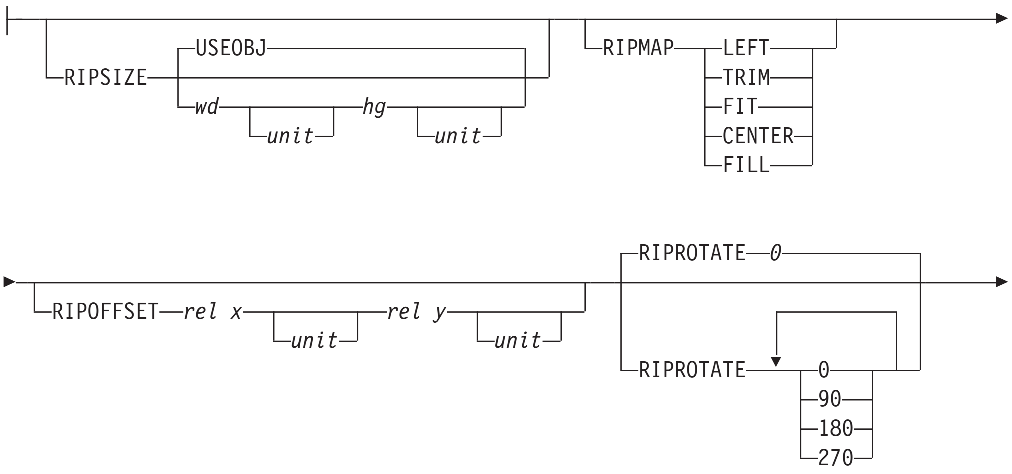
RECID
Get the name from the record id (Record Layout and XML page definitions only). This is the same as in the **FIELD** command. Use **START** *n* and **LENGTH** *n* to use only a portion of the record id, or leave them out to use the entire record field.

OBJECT Command

OBJECT Command



PreRip Parameters:



```
►─┬──────────────────────┬─────────────────────────────────────────────┤
  └─RIPPAGE──┬─n───┬─────┘
             └─ALL─┘
```

The **OBJECT** command allows you to define an external object to PPFA. Then you can use the **PRINTLINE** command (Traditional) or the **LAYOUT** command (Record Format and XML) with the **OBJECT** subcommand to place the defined object on a page.

You can use one **PRINTLINE** command (Traditional), **LAYOUT** command (Record Format), or **XLAYOUT** command (XML) to place one or many defined objects multiple times with different placement parameters on each placement. On the **PRINTLINE OBJECT** subcommand, enter information about the positioning, rotation, color, object size, page number, and mapping instructions. All positioning is relative to the print line coordinate system. The *lname* appears on both the **OBJECT** command and on the **PRINTLINE OBJECT** subcommand (Traditional), the **LAYOUT OBJECT** command (Record Format), and the **XLAYOUT OBJECT** command (XML), and is used similar to the way overlays and page segments are defined and placed (or printed).

Notes:

1. The *lname* is case insensitive but, other than that, the *lname* of the **OBJECT** command and of the **PRINTLINE OBJECT** subcommand (Traditional), the **LAYOUT OBJECT** command (Record Format), and the **XLAYOUT OBJECT** command (XML) must match exactly.
2. This function requires both the print server and printer support. Check your print server and printer documentation.
3. Fonts used by the **OBJECT** must be mapped. You can use the **EXTREF** command to map a font.
4. CMRs used by the **OBJECT** must be mapped. You can use the **EXTREF OB2CMR** command to map a CMR.

OBJECT *lname*

Identifies the object and also is used to match a **PRINTLINE OBJECT** subcommand (Traditional), the **LAYOUT OBJECT** command (Record Format), and the **XLAYOUT OBJECT** command (XML). The *lname* can be no more than 16 alphanumeric characters.

Subcommands

OBXNAME *x-name*

```
├──OBXNAME──┬─x-name──────┬──────────────────────────────────────────────┤
            ├─'x-name'────┤
            ├─C'x-name'───┤
            ├─E'x-name'───┤
            ├─A'x-name'───┤
            ├─X'hhhh'─────┤
            ├─U8'x-name'──┤
            ├─X8'hhhh'────┤
            ├─U16'x-name'─┤
            └─X16'hhhh'───┘
```

Specifies the external name of the resource object, which indicates where the object is located. This is the user access name which indicates where the object is located on the file system.

Notes:

1. Since this is a file system name, it must adhere to the rules of the platform where the object is located which could further restrict the sizes below, for example:
   - z/OS the *x-name* is the member name of the object in the object library and must be 8 characters or less and in uppercase EBCDIC code page 500.
2. All translations described below assume code page International #5 (code page 500) for EBCDIC and LATIN1 ISO/ANSI 8-bit (code page 819) for ASCII.

x-name

Unquoted name up to 250 characters long will be folded to upper case and translated into EBCDIC if necessary.

'*x-name***'**

Quoted name up to 250 characters long will be accepted as-is with no case folding or translation.

C'*x-name***'**

Quoted name with a "C" for Character will be treated the same as a quoted name up to 250 characters. No folding or translation is done.

A'*x-name***'**

Quoted name with an "A" for ASCII entered with up to 250 single-byte characters will be accepted as-is if on an ASCII platform or converted to ASCII if on an EBCDIC platform. The conversion will be made with no case folding.

E'*x-name***'**

Quoted name with an "E" for EBCDIC entered with up to 250 single-byte characters will be accepted as-is if on an EBCDIC platform or converted to EBCDIC if on an ASCII platform. The conversion will be made with no case folding.

X'*hhhh***'**

Quoted name with an "X" for Hexadecimal entered with up to 500 hexadecimal characters. The characters will be converted to hexadecimal, but no assumption of data type will be made.

U8'*x-name***'**

Quoted name with an "U8" for UTF-8 entered with up to 250 single-byte characters will be translated to UTF-8.

X8'*hhhh***'**

Quoted name with an "X8" for UTF-8 HEX entered with up to 500 single-byte hexadecimal characters will be translated to hexadecimal and assumed to be data type UTF-8. There must be a multiple of 2 hexadecimal characters entered.

U16'*x-name***'**

Quoted name with a "U16" for UTF-16 entered with up to 125 single-byte characters will be translated to UTF-16.

X16'*hhhh***'**

Quoted name with an "X16" for UTF-16 HEX entered with up to 500 single-byte hexadecimal characters will be translated to hexadecimal and assumed to be data type UTF-16. There must be a multiple of 4 hexadecimal characters entered.

To have portability across older versions of print servers in multiple system environment platforms, it is recommended that resource object names use EBCDIC encoding with code page 500.

OBTYPE

```
├──OBTYPE──┬─PSEG──────────────────────────┬─────────────────────────────────────────────────┤
           ├─IOCA──────────────────────────┤
           ├─BCOCA─────────────────────────┤
           ├─GOCA──────────────────────────┤
           ├─PTOCA─────────────────────────┤
           └─OTHER──OBID──┬─component-id─┬─┘
                          └─type-name────┘
```

Used to specify the type of the object. Observe that each of the object types restricts the type of mapping option allowed in the placement of the object (**OBMAP** on the **OBJECT** subcommand on the **PRINTLINE** command (Traditional) or the **LAYOUT** command (Record Format and XML)).

PSEG	Specifies a page segment object, as described in the *Mixed Object Document Content Architecture (MODCA) Reference Manual*. All mapping types (**OBMAP**) are allowed by PPFA; however, the print server issues an error if any of the objects contained in the page segment is not compatible with the coded **OBMAP** parameter.
GOCA	Specifies a graphics object, as described in the *Graphics Object Content Architecture (GOCA) Reference Manual*. **GOCA** allows you to specify **TRIM**, **FIT**, **CENTER**, **REPEAT**, and **FILL** parameters on the **OBMAP** subcommand.
BCOCA	Specifies a bar code object, as described in the *Bar Code Object Content Architecture (BCOCA) Reference Manual*. **BCOCA** allows you to specify only the **LEFT** parameter on the **OBMAP** subcommand.
IOCA	Specifies a image object, as described in the *Image Object Content Architecture (IOCA) Reference Manual*. The **IOCA** object type allows you to specify **TRIM**, **FIT**, **CENTER**, **REPEAT**, and **FILL** parameters on the **OBMAP** subcommand.
PTOCA	Specifies a presentation text object with Object Environment Group (OEG) as described in the *Presentation Text Object Content Architecture (PTOCA) Reference Manual* and the *Mixed Object Document Content Architecture (MODCA) Reference Manual*. The **PTOCA** object type allows you to specify the **LEFT** parameter in the **OBMAP** subcommand.
OTHER	Specifies other object data. The object data to be included is a paginated presentation object with a format that may or may not be defined by an AFP

presentation architecture. When you specify **OTHER**, you must also specify the **OBID** parameter. The **OTHER** object type allows you to specify **TRIM**, **FIT**, **CENTER**, **REPEAT**, and **FILL** parameters on the **OBMAP** subcommand.

OBID
Specifies either a component identifier or a type name from Table 16. The **OBID** is translated into an Encoded OID and matched to the OID inside the object; they must match.

component-id Specifies the component identifier.

type-name *Type-name* is a name chosen by PPFA as an alternative to coding a component identifier.

Table 16. Non-OCA Objects supported by IOB.

Type-Name	Component-id	Description of OBID Object Type
EPS	13	Encapsulated PostScript
TIFF or TIF	14	Tag Image File Format
WINDIB	17	Device Dependent Bit Map [DIB], Windows Version
OS2DIB	18	Device Dependent Bit Map [DIB], PM Version
PCX	19	Paintbrush Picture File Format
GIF	22	Graphics Interchange Format
JFIF, JPEG, or JPG	23	AFPC (AFP Consortium) JPEG Subset
PDFSPO	25	PDF Single Page Object
PCLPO	34	PCL Page Object
EPSTR	48	EPS with Transparency
PDFSPOTR	49	PDF Single Page Object with Transparency
MTIFF	61	TIFF Multiple Image File
MTIFFNT	62	TIFF Multiple Image without Transparency File
MPDF	63	PDF Multiple Page File
MPDFT	64	PDF Multiple Page with Transparency File
PNG	65	PNG File Format
AFPCTIFF	66	AFPC TIFF subset

Table 17. Object Types that can be referenced as Secondary Resources

Type-Name	Component-id	Description of OID Type-Name
PDFRO	26	PDF Resource Object (new)
RESCLRPRO	46	Resident Color Profile Resource Object
IOCAFS45RO	47	IOCA FS45 Resource Object Tile (new)

RENDER

```
├──RENDER──┬─PERCEPTUAL─┬──────────────────────────────────┤
           ├─SATURATION─┤
           ├─RELCM──────┤
           └─ABSCM──────┘
```

Note: See Chapter 8, “AFP Color Management,” on page 173 for more information about using the CMR subcommand.

Subcommand on the **OBJECT** command to specify the rendering intent (RI) for an object within a page definition.

RI is used to modify the final appearance of color data and is defined by the International Color Consortium (ICC). For more information on RI see the current level of the ICC Specification.

Not all object types have rendering intent. Rendering intent will be ignored for those. The following is a list of object types that can be specified as parameters on the **OBTYPE** subcommand, and the resulting rendering intent object type:

- PSEG - rendering intent specified on a PSEG is used for all object types
- IOCA - supported
- BCOCA - not supported. Rendering intent for BCOCA objects is fixed as media-relative colorimetric (RELCM).
- GOCA - supported
- PTOCA - supported
- OTHER - supported

rendering intent parameter

Specify the rendering intent for the preceding object type.

PERCEPTUAL

Perceptual rendering intent. It can be abbreviated as **PERCP**. With this rendering intent, gamut mapping is vendor-specific, and colors are adjusted to give a pleasing appearance. This intent is typically used to render continuous-tone images.

SATURATION

Saturation rendering intent. It can be abbreviated as **SATUR**. With this rendering intent, gamut mapping is vendor-specific, and colors are adjusted to emphasize saturation. This intent results in vivid colors and is typically used for business graphics.

RELCM

Media-relative colorimetric rendering intent. In-gamut colors are rendered accurately, and out-of-gamut colors are mapped to the nearest value within the gamut. Colors are rendered with respect to the source white point and are adjusted for the media white point. Therefore colors printed on two different media with different white points won't match colorimetrically, but may match visually. This intent is typically used for vector graphics.

ABSCM

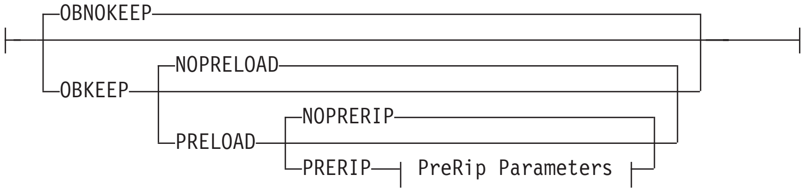
ICC-absolute colorimetric rendering intent.

In-gamut colors are rendered accurately, and out-of-gamut colors are mapped to the nearest value within the gamut. Colors are rendered only with respect to the source white point and are not adjusted for the media white point. Therefore colors printed on two different media with different white points should match colorimetrically, but may not match visually. This intent is typically used for logos.

CMYKSWOP | CMYKEURO

Indicates the color profile if it is required by the object.

OBNOKEEP



This object name is not included in a Map Data Resource structured field making the object loadable each time the object is placed on the page.

OBKEEP This object is included in a Map Data Resource at the beginning of the **PAGEDEF** making a hard object at the beginning of the page and then available throughout without reloading. Note that only objects with **OBTYPE IOCA** and **OTHER** can be kept. If **OBKEEP** is coded with other than those it is ignored.

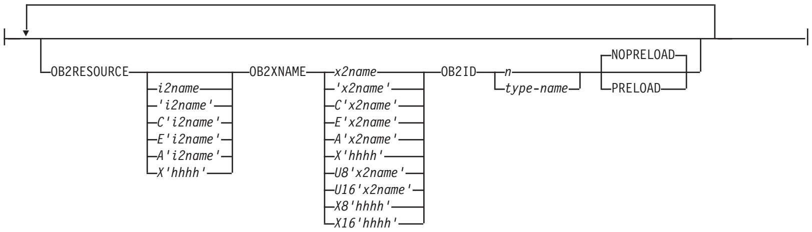
NOPRELOAD
Do not preload this object.

PRELOAD Preload this object prior to processing the print job.

NOPRERIP
Do not PreRip this object.

PRERIP
Prepare an object for printing by rasterizing it with its presentation parameters — object area size, object mapping option, object content offset, and object rotation with respect to the media leading edge.

OB2RESOURCE *i2name*



If the primary object contains a reference to one or more secondary objects, you must identify them at this point. Specify the internal name for the secondary resource as specified in the primary resource. If the internal name contains special characters such as periods or blanks, then quotes must surround the name.

i2name
: Unquoted name up to 250 characters long will be folded to upper case and translated into EBCDIC if necessary.

'*i2name*'
: Quoted name up to 250 characters long will be accepted as-is with no case folding or translation.

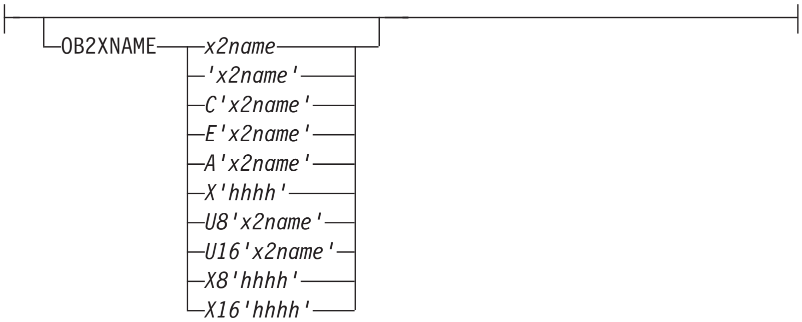
C'*i2name***'**
: Quoted name with a “C” for Character will be treated the same as a quoted name of up to 250 characters. No folding or translation will be done.

A'*i2name***'**
: Quoted name with an “A” for ASCII entered with up to 250 single-byte characters will be accepted as-is if on an ASCII platform or translated to ASCII if on an EBCDIC platform. The translation will be made with not case folding.

E'*i2name***'**
: Quoted name with an “E” for EBCDIC entered with up to 250 single-byte characters will be accepted as-is if on an EBCDIC platform or translated to EBCDIC if on an ASCII platform. The translation will be made with not case folding.

X'*hhhh***'**
: Quoted name with an “X” for Hexadecimal entered with up to 500 hexadecimal characters. The characters will be translated to hexadecimal, but no assumption of data type will be made.

OB2XNAME *x2name*



Specifies the external name for a secondary resource object. The name can be up to 250 characters. If the name contains special characters or blanks, it must be enclosed in blanks.

Note: Since this is a file system name, it must adhere to the rules of the platform where the object is located. This could further restrict the sizes as listed below.

x2name
Unquoted name up to 250 characters long will be folded to upper case and translated into EBCDIC if necessary.

'*x2name***'**
Unquoted name up to 250 characters long will be accepted as-is with no case folding or translation.

C'*x2name***'**
Quoted name with a "C" for Character will be treated the same as a quoted name up to 250 characters. No folding or translation is done.

A'*x2name***'**
Quoted name with an "A" for ASCII entered with up to 250 single-byte characters will be accepted as-is if on an ASCII platform or translated to ASCII if on an EBCDIC platform. The translation will be made with no case folding.

E'*x2name***'**
Quoted name with an "E" for EBCDIC entered with up to 250 single-byte characters will be accepted as-is if on an EBCDIC platform or translated to EBCDIC if on an ASCII platform. The translation will be made with no case folding.

X'*hhhh***'**
Quoted name with an "X" for Hexadecimal entered with up to 500 hexadecimal characters. The characters will be translated to hexadecimal, but no assumption of data type will be made.

U8'*x2name***'**
Quoted name with an "U8" for UTF-8 entered with up to 250 single-byte characters will be translated to UTF-8.

X8'*hhhh***'**
Quoted name with an "X8" for UTF-8 HEX entered with up to 500 single-byte hexadecimal characters will be translated to hexadecimal and assumed to be data type UTF-8. There must be a multiple of 2 hexadecimal characters entered.

U16'*x2name***'**
Quoted name with an "U16" for UTF-16 entered with up to 125 single-byte characters will be translated to UTF-16.

X16'*hhhh***'**
Quoted name with an "X16" for UTF-16 HEX entered with up to 500 single-byte hexadecimal characters will be translated to hexadecimal and assumed to be data type UTF-16. There must be a multiple of 4 hexadecimal characters entered.

All specified secondary resources are kept. See **OBKEEP** for more information.

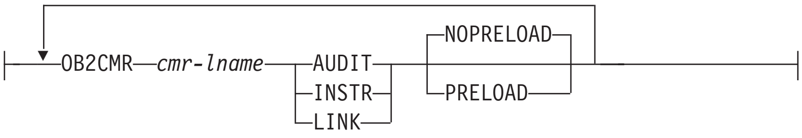
OB2ID *n* | *type-name*

Component type identifier for secondary resource; use an object type number as specified in Object type list adjustments. Use an object type number from the “Component-id” column or a type name from the “Type-Name” column of Table 17 on page 427.

NOPRELOAD | PRELOAD

All specified secondary resources are kept. If you wish the secondary object to be preloaded prior to the running of this job, specify it here.

OB2CMR



Note: See Chapter 8, “AFP Color Management,” on page 173 for more information about using the CMR subcommand.

Specify a Color management resource (CMR) and its process mode for a data object within the PAGEDEF. CMRs are secondary objects when used at this level. Multiple **OB2CMR** subcommands are allowed on the **OBJECT** command.

cmr-lname
The CMR local name. This name must have been defined with a **DEFINE CMRNAME** command.

processing mode parameter
Specify the processing mode for the CMR.

AUDIT
CMRs with the audit processing mode refer to processing that has already been applied to a resource. In most cases, audit CMRs describe input data and are similar to ICC input profiles.

The audit processing mode is used primarily with color conversion CMRs. In audit processing mode, those CMRs indicate which ICC profile must be applied to convert the data into the Profile Connection Space (PCS).

INSTR
CMRs with the instruction processing mode refer to processing that is done to prepare the resource for a specific printer using a certain paper or another device. Generally, instruction CMRs refer to output data and are similar to ICC output profiles.

The instruction processing mode is used with color conversion, tone transfer curve, and halftone CMRs. In instruction processing mode, these CMRs indicate how the system must convert a resource so it prints correctly on the target printer. The manufacturer of your printer should provide ICC profiles or a variety of CMRs that you can use. Those ICC profiles and CMRs might be installed in the printer controller, included with the printer on a CD, or available for download from the manufacturer's Web site.

LINK

This CMR defines a direct color conversion from an input color space to a device output color space; process the **CMR** as a link CMR. This processing mode is only valid for device link (DL) CMRs. The PPFA command RENDER is not used with device link (DL) CMRs as such CMRs specify the intended rendering intent internally. This function requires print server (PSF) and printer support which is in addition to the original CMR support.

NOPRELOAD | PRELOAD

All specified secondary resources are kept. If you wish the CMR object to be preloaded prior to the running of this job, specify it here.

Code Example:

In the following example, an object with CMR is defined. The **LAYOUT** commands below place the object on the page. The CMR name is defined and referenced by the CMR local name. See the **DEFINE CMRNAME** command for examples and instructions on defining CMR names.

```
PAGEDEF cmr89   replace yes;
    FONT  varb  gt10   ;          /*Variable data          */
    SETUNITS  LINESP .25 in ;     /* Line spacing          */

 DEFINE srgb CMRNAME
  'sRGBicc_CC001.000@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@'
   '@@@@@@';

 Object  oc1  obxname 'Flowers_with_sRGB_profile'
    obtype  other obid 23 OBKEEP
    ob2cmr srgb audit

    PAGEFORMAT  rept1   TOPMARGIN 1 in BOTMARGIN  2 in;
      LAYOUT 'startpage' BODY  NEWPAGE POSITION 1 in NEXT
        font varb
      object oc1 0 in 3 in obsize 6.5 in 8.5 in;
      LAYOUT 'basicline' BODY  POSITION SAME NEXT font varb;
```

OBRESOLUTION

```
├──┬───────────────────────────┬──────────────────────────────────┤
   └─OBRESOLUTION──x──y──┬─IN─┬┘
                         └─CM─┘
```

Specifies the resolution and unit of measurement of an image. If the resolution is already specified inside the image, this information is ignored by the printer. Use this subcommand for images that do not or may not contain their resolution. Specify resolution of an image so that the printer can print the image correctly.

To specify object resolution, you must have a printer and a print server (PSF or IPM) that support this capability.

If not specified, the default is to assume that the image resolution is the same as the printer. If the image does not print at the size you expect, use **OBRESOLUTION** to identify the image's resolution. With the resolution information, the printer will then be able print the image at the expected size.

x-res Specifies the number to be used for the horizontal resolution of an image. Specify an integer value in the range of 1-3276.

y-res Specifies the number to be used for the vertical resolution of an image. Specify an integer value in the range of 1-3276.

unit Specifies a unit of measurement. The choices are:

IN	Inch
CM	Centimeter

Code Example:

In the following example, the **OBJECT** command is used to define two JFIF objects. One is pre-ripped and the other is not. One has a resolution of 300 pels per inch in both the *x* and *y* directions. The other has a resolution of 600 pels per inch in both the *x* and *y* directions.

```
SETUNITS 2 in 2 in;
Pagedef obxres

OBJECT obres1 OBXNAME xpseg23 OBTYPE other OBID JFIF
       OBRESOLUTION 300 300 IN;
OBJECT obres2 OBXNAME xpseg24 OBTYPE other OBID JFIF
       OBRESOLUTION 600 600 IN;

PRINTLINE OBJECT obres1
 23 PELS 01 PELS  OBMap TRIM  OBSIZE  1.2 in 1.3 in ;
PRINTLINE OBJECT obres2
 34 PELS 01 PELS  OBMap TRIM  OBSIZE  1.2 in 1.3 in ;
```

PreRip Parameters for the OBJECT command.

These parameters are used to specify the exact rasterization of the object, its size, offset, mapping, and rotations.

Note: To specify multiple pages, rip sizes, mappings, and offsets for the same object, code multiple object commands.

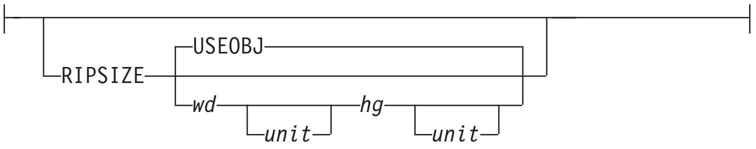
Notes:

1. **Mapping:** Mapping an object (also known as KEEPing) enhances throughput by allowing the printer to download an object once and use it on subsequent pages of the same print job or possibly on subsequent print jobs. Secondary objects are always mapped.
2. **Preloading:** Preloading an object consists of loading the object into the printer memory before the print job is started. This enhances throughput because it removes the downloading time from print-time to page build time.

3. **Preripping:** Preripping further enhances throughput because it allows the object and its secondary objects to be rasterized (RIPped) at the proper size and rotation when they are preloaded. When a primary object is preripped, all its secondary objects are also preloaded and preripped.

RIPSIZE

PreRip Parameters:



Specifies the size of the object placement area. When no **RIPSIZE** is specified, the default is the size specified in the object. If no size is specified in the object, the size of the page is used. The page width is specified on the **PAGEDEF** or **PAGEFORMAT** commands, or it defaults to 8.3 inches by 10.8 inches.

USEOBJ
Specifies that the size measurements specified in the object are to be used. If no size is specified in the object, the size of the page is used, which is the length and width as specified on the **PAGEDEF** or **PAGEFORMAT** commands, or it defaults to 8.3 inches by 10.8 inches.

wd Specifies the width of an object placement area as a number with up to three decimal places. The allowable width may vary with the type of printer used and the L-units specified with the **PELSPERINCH** parameter on the **PAGEDEF** or **PAGEFORMAT** command.

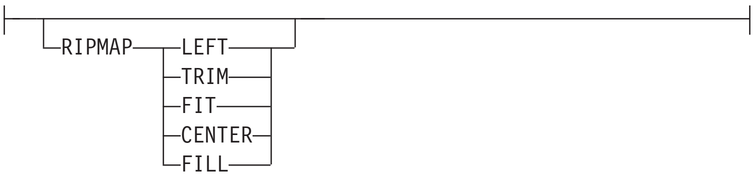
hg Specifies the height of an object placement area as a number with up to three decimal places. The allowable height may vary with the type of printer used and the L-units specified with the **PELSPERINCH** parameter on the **PAGEDEF** or **PAGEFORMAT** command.

unit
Specifies a unit of measurement for the width parameter. The choices are: **IN**, **MM**, **CM**, **POINTS**, or **PELS**.

Note: If no unit is specified, the default is the most recent **SETUNITS** command value or **IN** (inch) if a **SETUNITS** command has not been issued.

RIPMAP

PreRip Parameters:



Specifies mapping options. The **RIPMAP** parameter defines the mapping of the object to the object placement area. If **RIPMAP** is not coded, the mapping option within the object is used. If the object does not contain mapping option, then the print server sets it to the created default for container type. Each object type (**OBTYPE** on the **OBJECT** command) specifies the allowable mapping options for that type. See the **OBJECT OBTYPE** parameter for a description of the restrictions.

FIT

Specifies scale to fit. This is the default value of the **RIPMAP** parameter is not coded. The object is to be scaled to fit within the object placement area, as defined by the **RIPSIZE** parameter. The center of the object is placed in the center of the object placement area and the object is scaled up or down to fit the block. Scaling in the horizontal and vertical directions is symmetrical. The **FIT** parameter ensures that all of the data in the object is presented in the object placement area at the largest possible size. The object is not trimmed.

FILL

Specifies that the center of the data object be positioned coincident with the center of the object placement area. The data object is then scaled, so that it totally fills the object placement area in both the X and Y directions. This may require that the object be asymmetrically scaled by different scale factors in the X and Y directions.

LEFT

Specifies that the object is positioned at the upper, left-hand corner of the object placement area, as defined or defaulted by the *relative-xpos*, *relative-ypos*, and **RIPOFFSET** parameters. Any portion of the object that falls outside the object placement area as defined by the **RIPSIZE** parameter is not trimmed and could cause an exception condition by the presentation system. This mapping type is invalid with an IOCA object.

TRIM

Specifies position and trim. The object is positioned at the upper, left-hand corner of the object placement area, as defined or defaulted by the *relative-xpos*, *relative-ypos*, and **RIPOFFSET** parameters. Any portion of the object that falls outside the object placement area as defined by the **RIPSIZE** parameter is trimmed.

CENTER

Specifies that the center of the object positioned at the center of the object placement area. Any portion of the object falls outside the object placement area is trimmed.

RIPOFFSET

PreRip Parameters:

```
├──┬───────────────────────────────────────────────┬──┤
   └─RIPOFFSET─rel x──┬──────┬──rel y──┬──────┬────┘
                      └─unit─┘         └─unit─┘
```

Object Content Offset - Specifies the horizontal and vertical offset of the object contents within the object placement area, as defined by the **RIPSIZE** parameter. If **RIPOFFSET** is not specified, the object is preprocessed and cached at its full size. The content offset specified at Include time is then used to place and possibly trim the object to the object area, with an associated performance penalty.
The **RIPOFFSET** parameter is used only in **LEFT** and **TRIM** mapping of the object into the object placement area.

rel-x
Specifies the offset along the X-axis of the object area coordinates system. This can be a positive or negative number.

rel-y
Specifies the offset along the Y-axis of the object area coordinates system. This can be a positive or negative number.

unit
Specifies a unit of measurement for the width parameter. The choices are: **IN**, **MM**, **CM**, **POINTS**, or **PELS**.

Note: If no unit is specified, the default is the most recent **SETUNITS** command value or **IN** (inch) if a **SETUNITS** command has not been issued.

RIPROTATE { 0 | 90 | 180 | 270 }

PreRip Parameters:

```
   ┌─RIPROTATE──0────────────┐
├──┼─────────────────────────┼────────────────────────────────┤
   │           ┌──────────┐  │
   │           ▼          │  │
   └─RIPROTATE───┬─0────┬─┴──┘
                 ├─90───┤
                 ├─180──┤
                 └─270──┘
```

Specifies the object rotation with respect to the leading edge of the media. Up to 4 rotations can be specified.

Note: Many factors, such as media selection, media side, media loading media orientation, page orientation, and object area rotation affect the orientation of an object with respect to the media leading edge. Therefore proper specification of this parameter may require visual inspection of physical output.

RIPPAGE

PreRip Parameters::

```
├──┬─────────────────────┬────────────────────────────────────┤
   └─RIPPAGE──┬─n───┬────┘
              └─ALL─┘
```

RIPPAGE
Specifies the page number of a multipage object or file to be pre-RIPped. **n** is the page number. A number from 1 to 999999999 (9 digits) is valid. **ALL** specifies to pre-RIP all objects in a multipage object.

Examples: In the page definition below there are several examples of long names. This is for illustration only.

- **OBU8 —** The primary object name is specified in “U8” format which means that it is specified as a character string and translated to UTF-8 encoding.

  The secondary object defined on object OBU8 is referenced in the primary object with an identifier which is the equivalent of hexadecimal X'ABF8'. The external name for that object is specified in “C” format which means that the name is accepted as it with no translation or folding of case.
- **OBU16 —** This object name is specified in “U16” format which means that it is specified as a character string and translated to UTF-16 encoding.
- **OBX16 —** This object name is specified in “X16” format which means that it is specified as a Hexadecimal string representing the UTF-16 encoding. It is not translated. The only check that PPFA will make is that its length is a multiple of 4.

```
PAGEDEF LNNG2P  REPLACE YES;
  FONT FN1 GT10;
  OBJECT obU8 OBXNAME u8'A Long Object Name in UFT8'
  ' Which is continued on a second line'
  ' And could also be continued on a subsequent line'
         OBTYPE IOCA   OBKEEP PRELOAD
  OB2RESOURCE X'ABF8' OB2XNAME C'A plain old Character '
  ' type Secondary Object name which will be used as typed'
  ' in the code page of the User'  OB2ID PDFRO PRELOAD;

  OBJECT OBU16 OBXNAME U16'abcdef4'
         OBTYPE IOCA   OBKEEP PRELOAD;

  OBJECT obx16 OBXNAME X16'006100620063'
                          '0064006500660034'
         OBTYPE IOCA   OBKEEP PRELOAD;

  printline object obU8 FONT fn1;
  printline object obU16;
  printline object obX16;
```

The page definition below:

- An IOCA object is defined and placed. The object is to be mapped, preloaded, and preripped in 3 orientations (0, 90, 270). Object area size and offset mapping are specified. **TRIM** mapping specifies that the object is to be placed in the upper left corner of the object area, as defined by the **PRINTLINE** position and **RIPOFFSET** parameters, and, if necessary, trimmed to the object area size, as defined by **RIPSIZE**.

```
PAGEDEF RipXml Replace Yes;
 OBJECT ripit OBXNAME FS45pic OBTYPE IOCA
        OBKEEP PRELOAD
        PRERIP
          RIPSIZE   3.0 in 4.0 in
          RIPMAP    trim
```

```
           RIPOFFSET 1.0 in 1.5 in
           RIPROTATE 0,90,270
         ;
   PRINTLINE OBJECT ripit;
```

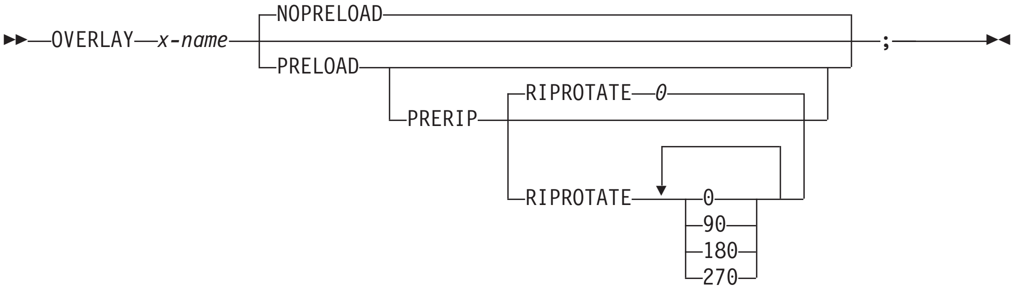
In the page definition below, multiple page objects are defined and placed. To specify the page number, see the descriptions of the parameters **RIPPAGE** and **OBPAGE**.

```
/*-------------------------------------------------------*/
/* MULTIEX2 multipage objects - Printline                */
/* Examples                                              */
/*                                                       */
/*-------------------------------------------------------*/
 setunits 1 in 1 in linesp 6 lpi;
 pagedef multx2 replace yes pelsperinch 600
          width 8.5 height 11.0;

 font f1 gt10;
/*-------------------------------------------------------*/
/* Define objects                                        */
/*-------------------------------------------------------*/

/*-------------------------------------------------------*/
/* Multipage objects OBID type name                      */
/*-------------------------------------------------------*/
 object npt02 obxname TIFFNT1  obtype other obid MTIFFNT;

/*-------------------------------------------------------*/
/* PRERIP ALL Multipage objects OBID component id        */
/*-------------------------------------------------------*/
 object pac03 obxname MPDF6 obtype other obid 63
          OBKEEP PRELOAD PRERIP RIPPAGE ALL;
/*-------------------------------------------------------*/
/* PRERIP  page Multipage objects OBID type name         */
/*-------------------------------------------------------*/
 object ppt04 obxname MPDFT7  obtype other obid MPDFT
          OBKEEP PRELOAD PRERIP RIPPAGE 6;

/*-------------------------------------------------------*/
/* pgfmt01:                                              */
/*-------------------------------------------------------*/
 pageformat pfmt01 ;

/*-------------------------------------------------------*/
/* Layout for placing objects                            */
/*-------------------------------------------------------*/
/* type name no prerip, pages 1, 2, 3                    */
/*-------------------------------------------------------*/
 printline
    object npt02 obpage 1
    object npt02 obpage 2
    object npt02 obpage 3;

/*-------------------------------------------------------*/
/* pgfmt02:  PRERIP ALL                                  */
/*-------------------------------------------------------*/
 pageformat pfmt02 ;

/*-------------------------------------------------------*/
/* Layout for placing objects PRERIP                     */
/*-------------------------------------------------------*/

/*-------------------------------------------------------*/
/* component id rip all, pages 4, 5, 6                   */
/*-------------------------------------------------------*/
 printline
    object pac03 obpage 4
```

```
    object pac03 obpage 5
    object pac03 obpage 6;

/*----------------------------------------------------------*/
/* pgfmt03: PRERIP page 6                                    */
/*----------------------------------------------------------*/
 pageformat pfmt03 ;

/*----------------------------------------------------------*/
/* Layout for placing objects PRERIP                         */
/*----------------------------------------------------------*/

/*----------------------------------------------------------*/
/* type name rip 6, page 6                                   */
/*----------------------------------------------------------*/
 printline
    object ppt04 obpage 6;
```

OVERLAY Command

OVERLAY Command



The **OVERLAY** command is used to identify an electronic overlay to be included in the print file. This function is similar to the **SEGMENT** command. A separate **OVERLAY** command is required for each overlay, including all overlay names that may be used with the **OVERLAY VARIABLE** keyword on **PRINTLINE**, **LAYOUT** or **XLAYOUT**. A maximum of 254 **OVERLAY** commands (each of the 254 names must be unique) can be specified for each page format.

The **OVERLAY** commands are nested within the **PAGEFORMAT** command. For Traditional:

```
PAGEFORMAT
   [ TRCREF ]
   [SEGMENT ]
   [ OVERLAY ]
   ...
   [ OVERLAY ]
```

For Record Format and XML:

```
PAGEFORMAT
   [SEGMENT ]
   [ OVERLAY ]
   ...
   [ OVERLAY ]
```

An overlay can be requested in the following two ways:
- Place the overlay using the **OVERLAY** subcommand on the **PRINTLINE** command (Traditional), the **LAYOUT** command (Record Format), or the **XLAYOUT** command (XML).
- Enter an Include Page Overlay (IPO) structured field in the line data. The name of the overlay on the IPO structured field must match exactly the overlay identified by this command. The IPO must specify a value of X'FFFFFF' for the X and Y offset parameters if the overlay is to be placed relative to the current line position.

To include page overlays without using the IPO structured field, see the "PRINTLINE Command" on page 465.

OVERLAY Identifies the overlay that is positioned on the page.

x-name The user access name (external name) for the overlay. *x-name* can be unquoted or enclosed in quotes.

unquoted-name
An unquoted overlay name can be up to 6 characters. It is folded to upper case, has a "O1" prefix added to it, and is translated to EBCDIC codepage 500 if necessary.

'*quoted-name***'**
A quoted overlay name can be up to 8 characters. No translation or case folding is done.

Subcommands

These subcommands are used to specify whether or not to preload and/or PreRip overlays.

Notes:

1. The printer must support the preloading and preripping functions.
2. **Mapping:** Mapping an overlay enhances throughput by allowing the printer to download an object once and use it on subsequent pages of the same print job or possibly on subsequent print jobs. Overlays are always mapped so it is not necessary for you to request mapping. Mapping an overlay provides sufficient performance for most applications.
3. **Preloading:** Preloading an overlay consists of loading the object into printer memory before the print job is started. This enhances throughput by removing downloading time from real time to the page build time.
4. **Preripping:** Preripping enhances throughput by allowing the resources to be rasterized (RIPped) at the proper size and rotation when they are preloaded.

NOPRELOAD
Do not preload the overlay.

PRELOAD
Preload the overlay before processing the print job.

NOPRERIP
Do not PreRip the overlay.

PRERIP
Prepare the overlay for printing by rasterizing it with its presentation rotation with respect to the media leading edge.

RIPROTATE { 0 | 90 | 180 | 270 }
Specifies the overlay rotation with respect to the leading edge of the media. Up to 4 rotations can be specified.

Note: Many factors, such as media selection, media side media loading, media orientation, page rotation, and overlay area rotation affect the orientation of the overlay with respect to the media leading edge. Therefore, proper specification of this parameter may require visual inspection of physical output.

Note: The prefix 'O1' is not part of the six-character user-access name. The overlay name can be alphanumeric.

OVERLAY Command Example

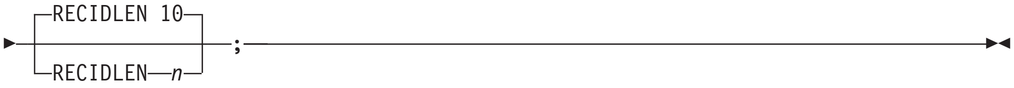
In the following example an overlay is defined and placed. The overlay will be preripped in 2 orientations, 180 and 0.

```
PAGEDEF RipXm2 Replace Yes;
  PAGEFORMAT pf1;
    OVERLAY ripit PRELOAD PRERIP OVBROTATE 180,0 ;

    PRINTLINE OVERLAY ripit;
```

PAGEDEF Command

PAGEDEF Command

```
                                                ┌─WIDTH── 8.3 ── IN ─┐
►►──PAGEDEF──name──┬──────────────────────────┬─┼────────────────────┼──────►
                   │              ┌─────────┐ │ └─WIDTH──n──┬──────┬─┘
                   │              ▼         │ │             └─unit─┘
                   └─COMMENT──────qstring───┴─┘

   ┌─HEIGHT── 10.8 ── IN ─┐                             ┌─DIRECTION──ACROSS────┐
►──┼──────────────────────┼─┬───────────────────────┬─┼──────────────────────┼──►
   └─HEIGHT──n──┬──────┬──┘ └─LINEONE──x-pos──y-pos─┘ └─DIRECTION──┬─DOWN─┬─┘
                └─unit─┘                                            ├─BACK─┤
                                                                    └─UP───┘

   ┌─REPLACE NO──┐
►──┼─────────────┼─┬──────────────────┬──┬─────────────────────────────┬──►
   └─REPLACE YES─┘ └─PELSPERINCH──n───┘  │  (1)                        │
                                         └──────TOPMARGIN──n──┬──────────┬─┘
                                                              ├─IN───────┤
                                                              ├─MM───────┤
                                                              ├─CM───────┤
                                                              ├─POINTS───┤
                                                              └─PELS─────┘

►──┬───────────────────────────┬──┬───────────────────────────────┬──►
   │  (1)                      │  │  (1)                          │
   └──────BOTMARGIN──n──┬────────┬─┘  └──────LEFTMARGIN──n──┬──────────┬─┘
                        ├─IN─────┤                          ├─IN───────┤
                        ├─MM─────┤                          ├─MM───────┤
                        ├─CM─────┤                          ├─CM───────┤
                        ├─POINTS─┤                          ├─POINTS───┤
                        └─PELS───┘                          └─PELS─────┘

►──┬─────────────────────────────┬──────────────────────────────────►
   │  (1)                        │
   └──────RIGHTMARGIN──n──┬────────┬─┘
                          ├─IN─────┤
                          ├─MM─────┤
                          ├─CM─────┤
                          ├─POINTS─┤
                          └─PELS───┘

                                                                  (2)
                                          ┌─UDType (EBCDIC or ASCII)─────┐
►──┬───────────────────────────────────┬──┼──────────────────────────────┼──►
   └─SOSIFONTS──sbcs-font──,──dbcs-font─┘  └─UDType───┬─EBCDIC─┬──────────┘
                                                      ├─ASCII──┤
                                                      ├─UTF8───┤
                                                      └─UTF16──┘
```



Notes:

1 *Record Format and XML only*

2 If **UDType** is not specified:
- For Traditional and Record Format page definitions, the User Data Type is unspecified if not coded. This means that no data type information is added to the page definition.
- For XML page definitions, the User Data Type defaults to the platform when **UDType** is not coded. That is, it defaults to EBCDIC when on a z/OS platform or ASCII when on an AIX or Windows platform.

A page definition is a resource used to define how data is formatted on a logical page. When generated by PPFA, a page definition is stored as a resource in the page-definition library. This command's subcommands allow you to use the page definition with the Record Format line data.

This command must be specified when you define a page definition. All of the **PAGEDEF** subcommands are optional; defaults are assumed.

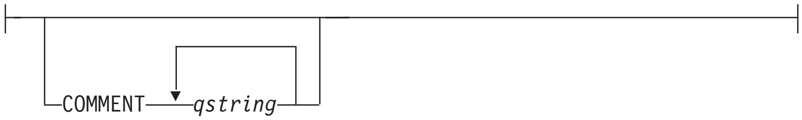
For Traditional only: Values assigned within the subcommands or the default values become the values for any **PAGEFORMAT** subcommand not specified. **REPLACE** is not a **PAGEFORMAT** subcommand, so its default is not carried forward.

PAGEDEF Identifies the page definition to be used with the print job.

name Defines an alphanumeric name of 1 to 6 characters for the page definition. When page definitions are generated, PPFA assigns the prefix ‘P1’ to this name as the external resource name.

Subcommands

COMMENT *qstring*



Specifies a user comment. This string comment is placed in the NOP structured field of the page definition.

qstring Specifies a quoted set of strings from 1 to 255 characters in total length.

WIDTH

```
   ┌─WIDTH── 8.3 ── IN ─┐
├──┤                    ├──────────────────────────────┤
   └─WIDTH──n──┬──────┬─┘
               └─unit─┘
```

Defines the width of the logical page.

n A number with up to three decimal places is used. The width may vary according to the type of printer being used. For more information, refer to your printer documentation. The default is **8.3 IN**.

unit Specifies a unit of measurement for the **WIDTH** subcommand. The choices are **IN**, **MM**, **CM**, **POINTS**, or **PELS**.

Note: If no unit is specified, the default is the most recent **SETUNITS** command value or **IN** (inch) if a **SETUNITS** command has not been issued.

HEIGHT

```
   ┌─HEIGHT── 10.8 ── IN ─┐
├──┤                      ├──────────────────────────────┤
   └─HEIGHT──n──┬──────┬──┘
                └─unit─┘
```

Defines the height of the logical page.

n A number with up to three decimal places is used. The height may vary according to the type of printer being used. For more information, refer to your printer documentation. The default is **10.8 IN**.

unit Specifies a unit of measurement for the **HEIGHT** subcommand. The choices are **IN**, **MM**, **CM**, **POINTS**, and **PELS**.

Note: If no unit is specified, the default is the most recent **SETUNITS** command value or **IN** (inch) if a **SETUNITS** command has not been issued.

LINEONE (Traditional only)

```
├──┬────────────────────────┬──────────────────────────────┤
   └─LINEONE──x-pos──y-pos──┘
```

Specifies the values for the **MARGIN** and **TOP** parameters used in the **POSITION** subcommand of the **PRINTLINE** command.

x-pos Specifies the offset from the left edge of the logical page (margin position). The valid options for *x-pos* are described in the **SETUNITS** command for the horizontal value.

Note: If no unit is specified, the default is the most recent **SETUNITS** command value or **IN** (inch) if a **SETUNITS** command has not been issued.

y-pos Specifies the vertical offset from the top of the logical page (top line position). The valid options for *y-pos* are described in the **SETUNITS** command for the vertical value.

Note: If no unit is specified, the default is the most recent **SETUNITS** command value or **IN** (inch) if a **SETUNITS** command has not been issued.

DIRECTION

```
   ┌─DIRECTION──ACROSS──────┐
├──┤                        ├──────────────────────────────────────┤
   └─DIRECTION────┬─DOWN─┤
                  ├─BACK─┤
                  └─UP───┘
```

Specifies the print direction of the logical page. Not all printers can print in all print directions. For more information, refer to your printer documentation.

Note: Some printers have a different media origin and require different direction settings than most page printers. For printing in the landscape page presentation when using wide forms, the **PRESENT** subcommand must be specified on the **FORMDEF** command to produce readable output. Alternatively, if you have existing page definitions, the **UP** direction can be used in the page definition without changes to the form definition to produce the same result.

ACROSS	The page is printed with the characters added *left to right* in each line, and the lines added from the top to the bottom.
DOWN	The page is printed with the characters added to the page from *top to bottom*, and the lines added from the right to the left.
BACK	The page is printed with the characters added to the page from *right to left*, and the lines added from the bottom to the top.
UP	The page is printed with the characters added to the page from *bottom to top*, and the lines added from the left to the right.

REPLACE

```
   ┌─REPLACE NO──┐
├──┤             ├─────────────────────────────────────────────┤
   └─REPLACE YES─┘
```

Specifies whether this page definition is to replace an existing one with the same resource name in the library.

NO	This page definition does not replace one with the same resource name in the library. If a page definition with the same resource name does not exist in the library, this page definition is stored.
YES	If a page definition with the same resource name already exists in the library, this page definition replaces it. If a page definition with the same resource name does not exist in the library, this page definition is stored.

PELSPERINCH *n*

```
├──┬──────────────────┬──────────────────────────────────┤
   └─PELSPERINCH──n───┘
```

Specifies the Logical Units in pels per inch for this page definition. Use the **PELSPERINCH** parameter to tell PPFA the pel resolution of your printer to generate more exact object placements.

n Specifies an integer number between 1 and 3,276, which determines the Logical Units in pels per inch.

Note: If the L-Units are not specified on this page definition, they are defaulted to 240 pels per inch.

```
PAGEDEF xmp01 replace yes
  PELSPERINCH 300 ;

  PAGEFORMAT P1
     width  7 in
     height 3 in;
   PRINTLINE;

  PAGEFORMAT P2
     width  7 in
     height 3 in
     PELSPERINCH 1200;
   PRINTLINE;
```

Figure 117. **PELSPERINCH** *example*

In the example above, the page definition xmp01 has specified L-Units as 300 pels per inch. Because the **PAGEFORMAT P1** does not specify L-Units, it inherits 300 pels per inch. **PAGEFORMAT P2** does specify L-Units as 1200 pels per inch.

The width and height in **PAGEFORMAT P1** (7 in, 3 in) produces internal and structured field values of 2100 and 900, whereas in **PAGEFORMAT P2** the same code produces values of 8400 and 3600, because of the difference in L-Units.

TOPMARGIN (Record Format and XML)

```
├──┬──────────────────────────┬────────────────────────────┤
   └─TOPMARGIN──n──┬────────┬─┘
                   ├─IN─────┤
                   ├─MM─────┤
                   ├─CM─────┤
                   ├─POINTS─┤
                   └─PELS───┘
```

This keyword with parameters specifies the amount of space to be reserved at the top of the page.

The default is 80% of the current line spacing.

BOTMARGIN (Record Format and XML)

```
├──┬─────────────────────────┬────────────────────────────────┤
   └─BOTMARGIN──n──┬─────────┘
                   ├─IN─────┤
                   ├─MM─────┤
                   ├─CM─────┤
                   ├─POINTS─┤
                   └─PELS───┘
```

This keyword with parameters specifies the amount of space to be reserved at the bottom of the page. Only **PAGETRAILER** data can be written into this area. If a graphic has not been ended at the time information is being placed in the bottom margin, the graphic is ended prior to the bottom margin. The default is **0**.

LEFTMARGIN (Record Format and XML)

```
├──┬──────────────────────────┬───────────────────────────────┤
   └─LEFTMARGIN──n──┬─────────┘
                    ├─IN─────┤
                    ├─MM─────┤
                    ├─CM─────┤
                    ├─POINTS─┤
                    └─PELS───┘
```

This keyword with parameters specifies the amount of space to be reserved at the left of the page. This is to be used only in conjunction with the **DRAWGRAPHIC** commands. Although PPFA collects the left margin information, it uses the value only within PPFA to define an area. The value itself is not passed in the datastream. The default is **0**.

RIGHTMARGIN (Record Format and XML)

```
├──┬───────────────────────────┬──────────────────────────────┤
   └─RIGHTMARGIN──n──┬─────────┘
                     ├─IN─────┤
                     ├─MM─────┤
                     ├─CM─────┤
                     ├─POINTS─┤
                     └─PELS───┘
```

This keyword with parameters specifies the amount of space to be reserved at the right of the page. This is only to be used in conjunction with the **DRAWGRAPHIC** commands. Although PPFA collects the right margin information, it uses the value only within PPFA to define an area. The value itself is not passed in the datastream. The default is **0**.

PAGECOUNT (Record Format and XML)

```
├──┬───────────────────────────────────────────────────────┬──┤
   └─PAGECOUNT──┬─CONTINUE──┬───┬──┬──┬─────┬──┬─────┬──────┘
                │           └─n─┘  │  └─CMP─┘  └─CCP─┘
                ├─STOP─────────────┤
                ├─RESUME──┬───┬────┤
                │         └─n─┘    │
                └─RESET──┬───┬─────┘
                         └─n─┘
```

This keyword allows the user to specify how the page counting is to be handled when switching between **PAGEFORMAT**s.

CONTINUE	Page counting continues from the previous **PAGEFORMAT** - this is the default. The *n* value is only used on the first **PAGEFORMAT** in the job, otherwise it is ignored. If this is the first **PAGEFORMAT** and no *n* value is specified, it defaults to one.
STOP	Page counting stops. Page count is captured from the previous **PAGEFORMAT**, but does not continue to count.
RESUME	Page counting continues from wherever it was the last time this **PAGEFORMAT** was called. The *n* value sets the value only the first time the **PAGEFORMAT** is invoked.
RESET	Page counting is reset to the value within then*n* value. If no *n* value is entered, then the page numbers are reset to one.
CMP	Count MO:DCA Pages option. Tells the print server to count any imbedded MO:DCA pages in the page count.
CCP	Count Constant Pages options. Tells the print server to count any pages that have no variable data on them.

SOSIFONTS

```
├──┬─────────────────────────────────────┬──────────────────────────┤
   └─SOSIFONTS──sbcs-font──,──dbcs-font──┘
```

The **SOSIFONTS**subcommand causes a Single-Byte Character Set (SBCS) font and a Double-Byte Character Set (DBCS) font to be mapped in a manner that will allow the proper font switching when Shift-in and Shift-out control sequences are encountered in printed text.

sbcs-font
A Single-Byte Character Set font. This font will be selected by the print server when a Shift-In (SI) control byte is encountered in text being presented.

dbcs-font
A Double-Byte Character Set font. This font will be selected by the print server when a Shift-Out (SO) control byte is encountered in text being presented.

Notes:

1. There are four ways to use SOSI fonts in a Traditional page definition:
   a. In the **PAGEDEF**, using the **FONT** placement subcommand to specify both the SBCS and DBCS fonts to be used. To use this method, define both a single-byte and double-byte font with the **FONT** or **DOFONT** commands. Then reference both fonts on the **FONT** subcommand on the **FIELD**, **PRINTLINE**, and so forth commands, separated by a comma. The single-byte font goes first. For example:

```
Pagedef sosiP1 replace yes;
  FONT sb1 GT10 SBCS;
  FONT db1 M40F DBCS;
  PAGEFORMAT PF1;
    PRINTLINE POSITION 1 in 1.2 in FONT sb1,db1;
```

   b. In the **PAGEDEF**, using the **PAGEFORMAT** subcommand **SOSIFONTS** to ensure that a single byte font is "mapped" first and a double byte font is "mapped" second in the **PAGEFORMAT**. To use this method, code both a single-byte and double-byte font with the FONT command. Then use the **SOSIFONTS** subcommand on the **PAGEFORMAT** command with the desired SBCS font coded first and the desired DBCS font coded next. For example:

```
Pagedef sosiL1 replace yes;
  FONT sb1 GT10 SBCS;
  FONT db1 M40F DBCS;
  PAGEFORMAT PF1 SOSIFONTS sb1,db1;

    PRINTLINE POSITION 1 in 1.2 in;
```

   Note: The **SOSIFONTS** subcommand can also be coded on the **PAGEFORMAT** command. Any **PAGEFORMAT**s that do not code a **SOSIFONTS** subcommand will inherit from the **PAGEDEF**.

   c. Specify fonts using the **CHARS** JCL parameter and no fonts in the **PAGEDEF** or no **PAGEDEF** using the default **PAGEDEF**. Using this method the first font defined in the **CHARS** is a SBCS font and the second is a DBCS font.

   d. Use the **TRCREF** command to defined the SBCS font as 0 and the DBCS font as 1. Do not specify a **FONT** subcommand on **PRINTLINE**, **FIELD**, and other commands when using this method. This method used only with a Traditional page definition. For example:

```
Pagedef sosiL1 replace yes;
  FONT sb1 GT10 SBCS;
  FONT db1 M40F DBCS;
  PAGEFORMAT PF1;
    TRCREF 0 FONT sb1;
    TRCREF 1 FONT db1;
    PRINTLINE;
```

2. You cannot mix Data Object fonts (defined with the **DOFONT** command) with FOCA fonts (defined with the **FONT** command) in the page definition in any but the first method of specifying SOSI fonts.

Notes:

1. There are three ways to use SOSI fonts in a Record Format or XML page definition:
   a. In the **PAGEDEF**, using the **FONT** placement subcommand to specify both the SBCS and DBCS fonts to be used. To use this method, you define both a single-byte and double-byte font with the **FONT** and **DOFONT** commands. Then you reference both fonts on the **FONT** subcommand on the **FIELD**, **XLAYOUT**, **LAYOUT**, and so forth commands, separated by a comma. The single-byte font goes first. For example:

```
Pagedef sosiP1 replace yes;
  FONT sb1 GT10 SBCS;
  FONT db1 M40F DBCS;
  PAGEFORMAT PF1;
    LAYOUT 'l1' POSITION 1 in 1.2 in FONT sb1,db1;
```

b. In the **PAGEDEF**, using the **PAGEFORMAT** subcommand **SOSIFONTS** to insure that a single byte font is "mapped" first and a double byte font is "mapped" second in the **PAGEFORMAT**. To use this method, code both a single-byte and double-byte font with the FONT command. Then you use the **SOSIFONTS** subcommand on the **PAGEFORMAT** command with the desired SBCS font coded first and the desired DBCS font coded next. For example:

```
Pagedef sosiL1 replace yes;
  FONT sb1 GT10 SBCS;
  FONT db1 M40F DBCS;
  PAGEFORMAT PF1 SOSIFONTS sb1,db1;

    LAYOUT 'l1' POSITION 1 in 1.2 in;
```

Note: The **SOSIFONTS** subcommand can also be coded on the **PAGEFORMAT** command. Any **PAGEFORMAT**s that do not code a **SOSIFONTS** subcommand will inherit from the **PAGEDEF**.

c. Define fonts using the **CHARS** and no fonts in the **PAGEDEF** or no **PAGEDEF** using the default **PAGEDEF**. Using this method the first font defined in the **CHARS** is a SBCS font and the second is a DBCS font.

2. You cannot mix Data Object fonts (defined with the **DOFONT** command) with normal FOCA fonts (defined with the **FONT** command) in the page definition in any but the first method of specifying SOSI fonts. That is only when you specify both fonts on the placement command.

UDType

```
                             (1)
   ┌─UDType (EBCDIC or ASCII)─────┐
├──┼──────────────────────────────┼────────────────────────────┤
   └─UDType──┬─EBCDIC─┬───────────┘
             ├─ASCII──┤
             ├─UTF8───┤
             └─UTF16──┘
```

Notes:

1 If **UDType** is not specified:
  - For Traditional and Record Format page definitions, the User Data Type is unspecified if not coded. This means that no data type information is added to the page definition.
  - For XML page definitions, the User Data Type defaults to the platform when **UDType** is not coded. That is, it defaults to EBCDIC when on a z/OS platform or ASCII when on an AIX or Windows platform.

This subcommand identifies the encoding of your data. If **UDType** is not coded on the **PAGEDEF**, it defaults to either ASCII or

EBCDIC to match the platform. For example if PPFA is run on a z/OS platform and **UDType** is not coded it defaults to EBCDIC.

UDType on the **PAGEDEF** command is used for several things:

1. Allow PPFA to translate fixed text to the specified **UDType** from either ASCII or EBCDIC according to the platform on which the PPFA compile is done.
2. To set the default for all **DOFONT** (Data Object Font) commands so you don't have to code **UDType** on each **DOFONT** command.
3. To pass encoding information to the printer for converting non-UTF16 user data to UTF16 when using a **DOFONT** command. (True Type is an example of a **DOFONT**).
4. Allows PSF or ACIF to know to look for a Byte Order Mark (BOM) when your data type is UTF8 or UTF16 and contains a BOM.

If the data does not match the platform data type, PPFA will translate the following constant page definition data to the encoding specified by **UDType**:

- **FIELD** command text (all page definitions)
- **CONDITION** text (all page definitions)
- **LAYOUT** command 'record ID' (Record Format page definition only)
- **LAYOUT** command delimiter (Record Format page definition only)
- **XLAYOUT** command starttags (XML page definition only)
- **XLAYOUT** command delimiter (XML page definition only)
- **DEFINE QTAG** command start tags (XML page definition only)
- **FIELD** attribute names (XML page definition only)

Notes:

1. For data with a Byte Order Mark (BOM), you must specify **UDType**, and the BOM must be the first two bytes (**UTF16**) or three bytes (**UTF8**) in the first line data record following any CC or TRC bytes. A BOM in the data is required if the data is **UTF16** Little Endian.
2. If the **UDType** parameter is specified, all of the user data processed by this page definition must be of that data type. Having data that is not of the specified encoding type could lead to improper translation of that data which would, for example, not allow the text in a **CONDITION** statement to be matched to the data.
3. If **UDType** is not coded on the **PAGEDEF**, then the **UDType** on the **DOFONT** command or **TYPE** on the **FONT** command determines the translation, but only for the data placed by that font.
4. If you have multiple data type encodings in a data file you must not code **UDType** on the page definition. Instead, for Data Objects Fonts, code **UDType** on the **DOFONT** command for the fonts that place the individual fields or records. And for regular FOCA fonts, you use fonts of the type matching the data for the individual fields or records.
5. If you use ACIF to generate your print document and the **NEWLINE ENCODING** value does not agree with the

UDType subcommand on the **PAGEDEF** command, ACIF issues a warning message but continues processing the file.

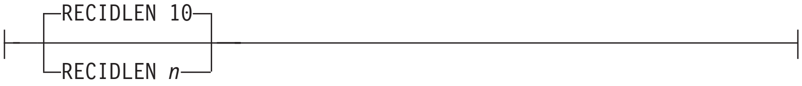
6. The **UDType** coded on the **PAGEDEF** is inherited by the **DOFONT** if **NONE** is coded on the **DOFONT** command. And, if no **UDType** is coded on either the **PAGEDEF** or the **DOFONT**, the **DOFONT** defaults to the platform encoding.
7. The **UDType** coded or not coded on the **PAGEDEF** does not affect the **FONT** command inheritance of data type, or in any way except to provide translation for fixed text being placed by the **FONT** command.
8. If **UDType** is not the same as the **UDType** coded on the **DOFONT** command, PPFA issues an error message and no page definition is generated.
9. To use multiple font mappings for a line in **ASCII**, **UTF8**, or **UTF16** you must use the **FIELD** command, since automatic font switching for single and double byte text is only done for EBCDIC data.
10. **SBCS**, **DBCS**, **TYPE**, and **UDTYPE** are different parameters that can affect fonts. **TYPE** indicates this is an ASCII or EBCDIC font being defined to use for printing. **UDTYPE**, which is not on the **FONT** command, indicates this is the type of the user's data, ASCII or EBCDIC. **SBCS** and **DBCS** indicate what type of character set the defined font uses, single byte (**SBCS**) or double byte (**DBCS**).
11. If **UDTYPE** is coded on the **PAGEDEF** and an id name or text is explicitly defined with another type, an error results and the page definition is not generated. In the next example:

```
PAGEDEF cmr1is replace yes UDTYPE ASCII;
FONT  varb  gt10;
SETUNITS  LINESP .25 in;
PAGEFORMAT  rept1  TOPMARGIN .25 in BOTMARGIN  .25 in;
LAYOUT E'startpage' BODY  NEWPAGE POSITION .25 in NEXT font varb;
```

    PAGEDEF with **UDTYPE ASCII** and **LAYOUT** with **E'startpage'**, the **ASCII** type does not match the **'E'EBCDIC** type.

EBCDIC	Single-byte EBCDIC code page 500.
ASCII	Single-byte ASCII code page 819
UTF8	Unicode encoding form UTF-8 toleration mode (surrogates are allowed).
UTF16	Unicode encoding form UTF-16. **Note:** The **PAGEDEF** is created in UTF-16BE (Big Endian). If the data is in UTF16LE, PSF translates it to UTF-16BE before processing.

RECIDLEN



Specifies the length of the Record Descriptor ID in bytes. This is also known as the "LAYOUT name". If the **RECIDLEN** parameter is not coded on a **PAGEFORMAT** command, it inherits the value from the specified or default value on the page definition. If the **RECIDLEN** parameter is not coded on a **PAGEDEF** command, the default length is 10 bytes.

Notes:

1. Use the **RECIDLEN** keyword on Record Format page definition only.
2. This parameter can only be used in a Record Format page definition.

n Specifies that the 'record ID' on the **LAYOUT** command is to be “*n*” bytes long. The allowable value of “*n*” is 1 to 250. UTF-16 data characters are 2 bytes long allowing up to 125 UTF-16 characters. Any 'record ID' on a **LAYOUT** command that is less than this length is padded to the specified length with blanks of the type specified or defaulted in the **UDType** subcommand on the **PAGEDEF** command. A 'record ID' that is longer than “*n*” is flagged as an error by PPFA and no page definition is generated.

Note: If the User Data Type (**UDType**) is **UTF16** and this number is odd, it is rounded up to the next even number.

Code Example:

In the following example, User Data Type **UTF16** and **RECIDLEN 24** are specified on the **PAGEDEF** command and the **RECIDLEN 26** is specified on the second **PAGEFORMAT** command (pf2).

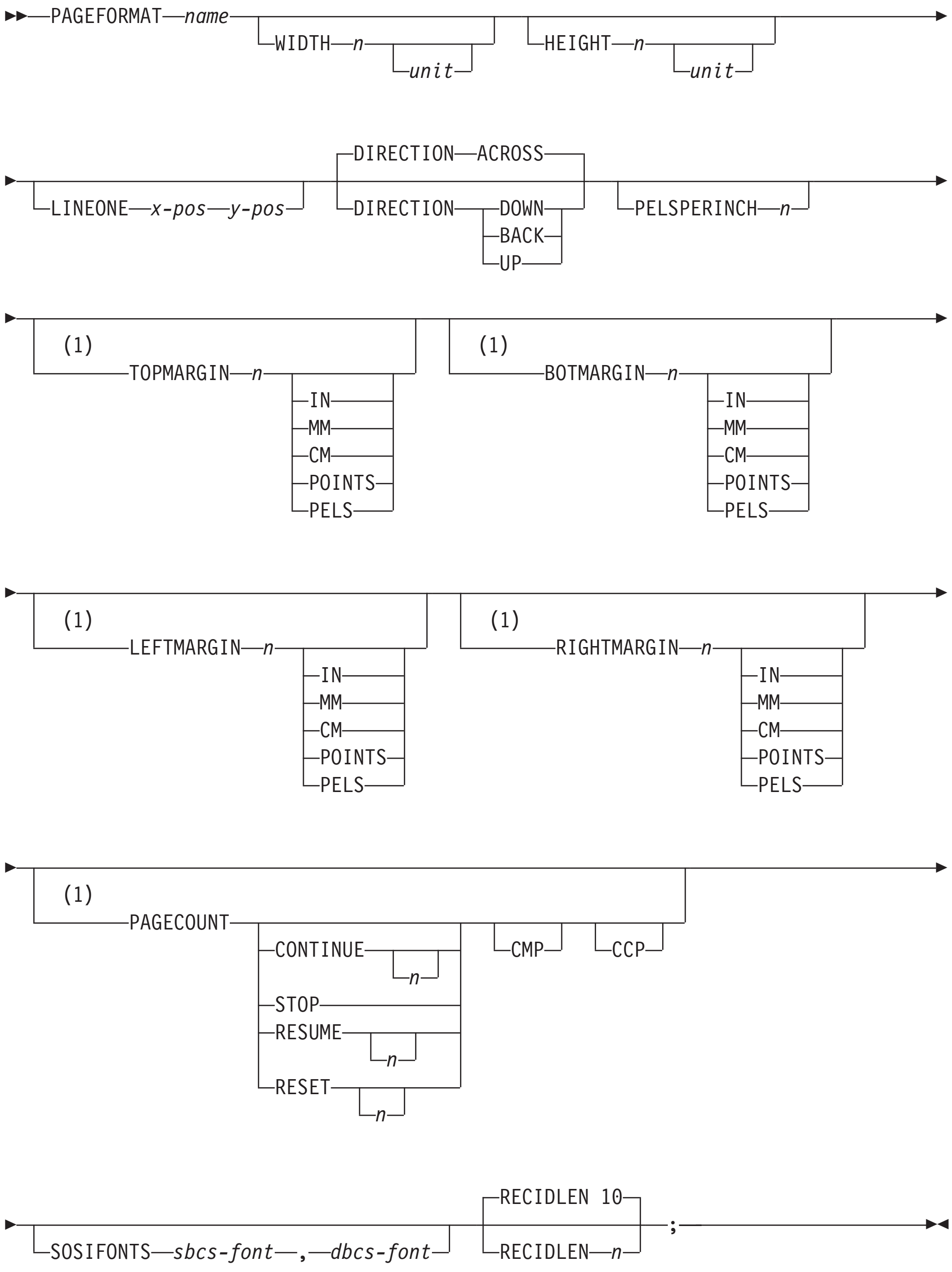
For the two page formats “pf1” and “pf2”.

1. “pf1” inherits a **RECIDLEN** of 24 bytes from the page definition, and the User Data Type for the entire page definition is UTF-16.
   a. The **LAYOUT** name 'Long Name 1' is translated to UTF-16 and padded to 24 bytes with UTF-16.
   b. The delimiter '/' on the **LAYOUT** is translated to UTF-16.
   c. The **FIELD** command text 'abcd' is translated to UTF-16.
2. “pf2” specifies a **RECIDLEN** fo 26 bytes and gets **UDType** UTF-16 from the page definition.
   a. The **LAYOUT** name 'Long Name 2' is translated to UTF-16 and padded to 26 bytes with UTF-16.
   b. The **CONDITION** command text 'ABCDEFGH' is translated to UTF-16. Note that the field length of the 8 character string is 16 bytes because each character is 2 bytes long.

```
PAGEDEF xmp1  UDType UTF16  RECIDLEN 24  REPLACE yes;

   FONT  comp  a075nc TYPE UNICODE
   FONT  comp2 a075bg TYPE UNICODE

   PAGEFORMAT pf1;
     LAYOUT    'Long Name 1' DELIMITER '/'  Position 2 1 FONT comp;
       FIELD  TEXT 'abcd'          Position 2.5 1.5,

   PAGEFORMAT pf2 RECIDLEN 26;
     LAYOUT    'Long Name 2'       POSITION 2 1 FONT comp2;
       CONDITION cn1 START 13 Length 16
          WHEN EQ 'ABCDEFGH'  NULL Pageformat pf1;
```

PAGEFORMAT Command

PAGEFORMAT Command



Notes:

1 **Record Format and XML only.**

Page formats are subsets of page definitions. If you want to use more than one set of specifications to format a page within a single print job, you must use more than one page format. To change page formats, use conditional processing or insert an Invoke Data Map structured field in your print file. (Page formats are known to the print server as data maps.) If you do not use conditional processing or if you do not insert an Invoke Data Map structured field, the print server uses only the first page format in the page definition. Page formats are placed in the page definition in the order in which they are generated.

PAGEFORMAT subcommands have no fixed defaults. The entire **PAGEFORMAT** command and all of its subcommands can assume defaults. If any **PAGEFORMAT** subcommand is omitted, its value is selected from the corresponding subcommand in the governing **PAGEDEF** command.

This command can be omitted for the first page format in a page definition if only one page format is used. If omitted, PPFA assigns a page format name by using the page-definition name, including the ‘P1’ prefix.

PAGEFORMAT *name*

Specifies an alphanumeric name of 1 to 8 characters. This name must be unique within the page definition.

The following subcommands are used for each page format. They may be issued in the same way as in a page definition. Values specified in the **PAGEDEF** subcommands are used if any of the following subcommands are not defined within a page format.

Subcommands

WIDTH

```
├──┬──────────────────┬────────────────────────────────────────┤
   └─WIDTH──n──┬──────┬┘
               └─unit─┘
```

Defines the width of the logical page.

n A number with up to three decimal places is used. The width may vary according to the type of printer being used. For more information, refer to your printer documentation.

unit Specifies a unit of measurement for the **WIDTH** subcommand. The choices are **IN**, **MM**, **CM**, **POINTS**, or **PELS**.

Note: If no unit is specified, the default is the most recent **SETUNITS** command value or **IN** (inch) if a **SETUNITS** command has not been issued.

HEIGHT

```
├──┬───────────────────┬───────────────────────────────────────┤
   └─HEIGHT──n──┬──────┬┘
                └─unit─┘
```

Defines the height of the logical page.

n A number with up to three decimal places is used. The height may vary according to the type of printer being used. For more information, refer to your printer documentation.

unit Specifies a unit of measurement for the **HEIGHT** parameter. The choices are **IN**, **MM**, **CM**, **POINTS**, or **PELS**.

Note: If no unit is specified, the default is the most recent **SETUNITS** command value or **IN** (inch) if a **SETUNITS** command has not been issued.

LINEONE (Traditional)

```
├─┬──────────────────────┬──────────────────────────────────────┤
  └─LINEONE──x-pos──y-pos─┘
```

Specifies the values for the **MARGIN** and **TOP** parameters used in the **POSITION** subcommand of the **PRINTLINE** command.

x-pos Specifies the offset from the left edge of the logical page (margin position). The valid options for *x-pos* are described in the **SETUNITS** command for the horizontal value.

Note: If no unit is specified, the default is the most recent **SETUNITS** command value or **IN** (inch) if a **SETUNITS** command has not been issued.

y-pos Specifies the offset from the top of the logical page (top line position). The valid options for *y-pos* are described in the **SETUNITS** command for the vertical value.

Note: If no unit is specified, the default is the most recent **SETUNITS** command value or **IN** (inch) if a **SETUNITS** command has not been issued.

DIRECTION

```
  ┌─DIRECTION──ACROSS───────┐
├─┼─────────────────────────┼─────────────────────────────────┤
  └─DIRECTION──┬─DOWN─┬─────┘
               ├─BACK─┤
               └─UP───┘
```

Specifies the print direction of the logical page. Not all printers can print in all print directions. For more information, refer to your printer documentation.

Note: Some printers have a different form origin and require different direction settings than most page printers. For printing in the landscape page presentation when using wide forms, the **PRESENT** subcommand must be specified on the **FORMDEF** command to produce readable output. Alternatively, if you have existing page definitions, the **UP** direction can be used in the page definition without changes to the form definition to produce the same result.

ACROSS The page is printed with the characters added to the page from *left to right*, and the lines added from the top to the bottom.

DOWN The page is printed with the characters added to the page from *top to bottom*, and the lines added from the right to the left.

BACK	The page is printed with the characters added to the page from *right to left*, and the lines added from the bottom to the top.
UP	The page is printed with the characters added to the page from *bottom to top*, and the lines added from the left to the right.

For Record Format and XML **DIRECTION** effects the meaning of the following new margin parameters.

- If the **DIRECTION** is **ACROSS**, then **TOPMARGIN** refers to the margin in the short end of the physical page where the tops of the characters point toward that same short end.
- If the **DIRECTION** is **DOWN**, then **TOPMARGIN** refers to the margin in the long end of the physical page where the tops of the characters point toward that same long end.

PELSPERINCH *n*

Specifies the Logical Units in pels per inch for this page format. Use the **PELSPERINCH** parameter to tell PPFA the pel resolution of your printer to generate more exact object placements.

n

```
├──┬──────────────────┬──────────────────────────────────────┤
   └─PELSPERINCH──n───┘
```

Specifies an integer number between 1 and 3,276, which determines the Logical Units in pels per inch.

Note: If the L-Units are not specified on the page format, they are inherited from the page definition that contains this page format. See Figure 117 on page 448.

TOPMARGIN (Record Format and XML)

```
├──┬──────────────────────────────┬──────────────────────┤
   └─TOPMARGIN──n──┬────────────┬─┘
                   ├─IN─────────┤
                   ├─MM─────────┤
                   ├─CM─────────┤
                   ├─POINTS─────┤
                   └─PELS───────┘
```

This keyword with parameters specifies the amount of space to be reserved at the top of the page. The default is 80% of the current line spacing.

BOTMARGIN (Record Format and XML)

```
├──┬──────────────────────────────┬──────────────────────┤
   └─BOTMARGIN──n──┬────────────┬─┘
                   ├─IN─────────┤
                   ├─MM─────────┤
                   ├─CM─────────┤
                   ├─POINTS─────┤
                   └─PELS───────┘
```

This keyword with parameters specifies the amount of space to be reserved at the bottom of the page. The default is 0.

LEFTMARGIN (Record Format and XML)

```
├──┬──────────────────────────┬──────────────────────────────────┤
   └─LEFTMARGIN──n──┬────────┬┘
                    ├─IN─────┤
                    ├─MM─────┤
                    ├─CM─────┤
                    ├─POINTS─┤
                    └─PELS───┘
```

This keyword with parameters specifies the amount of space to be reserved at the left of the page. This is only used in conjunction with the **DRAWGRAPHIC** commands. Although PPFA collects the left margin information, the value is used only within PPFA to define an area. The value itself is not passed in the datastream. The default is 0.

RIGHTMARGIN (Record Format and XML)

```
├──┬───────────────────────────┬─────────────────────────────────┤
   └─RIGHTMARGIN──n──┬────────┬┘
                     ├─IN─────┤
                     ├─MM─────┤
                     ├─CM─────┤
                     ├─POINTS─┤
                     └─PELS───┘
```

This keyword with parameters specifies the amount of space to be reserved at the right of the page. This is only to be used in conjunction with the **DRAWGRAPHIC** commands. Although PPFA collects the right margin information, it uses the value only within PPFA to define an area. This value itself is not passed in the datastream. The default is 0.

PAGECOUNT (Record Format and XML)

```
├──┬──────────────────────────────────────────────────────┬──────┤
   └─PAGECOUNT──┬────────────────────┬──┬─────┬──┬─────┬──┘
                ├─CONTINUE──┬───┬────┤  └─CMP─┘  └─CCP─┘
                │           └─n─┘    │
                ├─STOP───────────────┤
                ├─RESUME──┬───┬──────┤
                │         └─n─┘      │
                └─RESET──┬───┬───────┘
                         └─n─┘
```

This keyword allows the user to specify how the page counting is to be handled when switching between page formats.

CONTINUE	Page counting continues from the previous page format - this is the default. The *n* value is only used on the first **PAGEFORMAT** in the job, otherwise it is ignored. If this is the first **PAGEFORMAT** and no *n* value is specified, it defaults to one.
STOP	Page counting stops. Page count is captured from the previous page format, but does not continue to count.

RESUME	Page counting continues from wherever it was the last time this page format was called. The *n* value sets the value only the first time page format is invoked.
RESET	Page counting is reset to the value within the *n* value. If no *n* value is entered, then the page numbers are reset to one.
CMP	Count MO:DCA Pages option. Tells the print server to count any imbedded MO:DCA pages in the page count.
CCP	Count Constant Pages options. Tells the print server to count any pages that have no variable data on them.

SOSIFONTS

```
├──┬───────────────────────────────────┬──────────────────────────┤
   └─SOSIFONTS──sbcs-font──,──dbcs-font─┘
```

The **SOSIFONTS**subcommand causes a Single-Byte Character Set (SBCS) font and a Double-Byte Character Set (DBCS) font to be mapped in a manner that will allow the proper font switching when Shift-in and Shift-out control sequences are encountered in printed text.

sbcs-font
A Single-Byte Character Set font. This font will be selected by the print server when a Shift-In (SI) control byte is encountered in text being presented.

dbcs-font
A Double-Byte Character Set font. This font will be selected by the print server when a Shift-Out (SO) control byte is encountered in text being presented.

Notes:

1. There are four ways to use SOSI fonts in a Traditional page definition:
   a. In the **PAGEDEF**, using the **FONT** placement subcommand to specify both the SBCS and DBCS fonts to be used. To use this method, you define both a single-byte and double-byte font with the **FONT** and **DOFONT** commands. Then you reference both fonts on the **FONT** subcommand on the **FIELD**, **PRINTLINE**, **LAYOUT**, and so forth commands, separated by a comma. The single-byte font goes first. For example:
      ```
      Pagedef sosiP1 replace yes;
        FONT sb1 GT10 SBCS;
        FONT db1 M40F DBCS;
        PAGEFORMAT PF1;
          PRINTLINE POSITION 1 in 1.2 in FONT sb1,db1;
      ```
   b. In the **PAGEDEF**, using the **PAGEFORMAT** subcommand **SOSIFONTS** to insure that a single byte font is “mapped” first and a double byte font is “mapped” second in the **PAGEFORMAT**. To use this method, code both a single-byte and double-byte font with the FONT command. Then you use the **SOSIFONTS** subcommand on the

PAGEFORMAT command with the desired SBCS font coded first and the desired DBCS font coded next. For example:

```
Pagedef sosiL1 replace yes;
  FONT sb1 GT10 SBCS;
  FONT db1 M40F DBCS;
  PAGEFORMAT PF1 SOSIFONTS sb1,db1;

    PRINTLINE POSITION 1 in 1.2 in;
```

Note: The **SOSIFONTS** subcommand can also be coded on the **PAGEDEF** command. It will be inherited on any **PAGEFORMAT**s that do not code a **SOSIFONTS** subcommand.

c. Define fonts using the **CHARS** and no fonts in the **PAGEDEF** or no **PAGEDEF** using the default **PAGEDEF**. Using this method the first font defined in the **CHARS** is a SBCS font and the second is a DBCS font.

d. **Traditional Only:** Use the **TRCREF** command to define the SBCS font as 0 and the DBCS font as 1. Do not specify a **FONT** subcommand on the **PRINTLINE**, **FIELD**, and so forth commands, when using this method. This method is for use with a traditional page definition only. For example:

```
Pagedef sosiL1 replace yes;
  FONT sb1 GT10 SBCS;
  FONT db1 M40F DBCS;
  PAGEFORMAT PF1;
    TRCREF 0 FONT sb1;
    TRCREF 1 FONT db1;
    PRINTLINE;
```

2. You cannot mix Data Object fonts (defined with the **DOFONT** command) with normal FOCA fonts (defined with the **FONT** command) in the page definition in any but the first method of specifying SOSI fonts. That is only when you specify both fonts on the placement command.

Notes:

1. There are three ways to use SOSI fonts in a Record Format or XML page definition:
   a. In the **PAGEDEF**, using the **FONT** placement subcommand to specify both the SBCS and DBCS fonts to be used. To use this method, you define both a single-byte and double-byte font with the **FONT** and **DOFONT** commands. Then you reference both fonts on the **FONT** subcommand on the **FIELD**, **PRINTLINE**, **LAYOUT**, and so forth commands, separated by a comma. The single-byte font goes first. For example:

```
Pagedef sosiP1 replace yes;
  FONT sb1 GT10 SBCS;
  FONT db1 M40F DBCS;
  PAGEFORMAT PF1;
    LAYOUT 'L1' POSITION 1 in 1.2 in FONT sb1,db1;
```

   b. In the **PAGEDEF**, using the **PAGEFORMAT** subcommand **SOSIFONTS** to insure that a single byte font is “mapped” first and a double byte font is “mapped” second in the **PAGEFORMAT**. To use this method, code both a single-byte and double-byte font with the FONT command.

Then you use the **SOSIFONTS** subcommand on the **PAGEFORMAT** command with the desired SBCS font coded first and the desired DBCS font coded next. For example:

```
Pagedef sosiL1 replace yes;
  FONT sb1 GT10 SBCS;
  FONT db1 M40F DBCS;
  PAGEFORMAT PF1 SOSIFONTS sb1,db1;

    LAYOUT 'l1' POSITION 1 in 1.2 in;
```

Note: The **SOSIFONTS** subcommand can also be coded on the **PAGEDEF** command. It will be inherited on any **PAGEFORMAT**s that do not code a **SOSIFONTS** subcommand.

c. Define fonts using the **CHARS** and no fonts in the **PAGEDEF** or no **PAGEDEF** using the default **PAGEDEF**. Using this method the first font defined in the **CHARS** is a SBCS font and the second is a DBCS font.

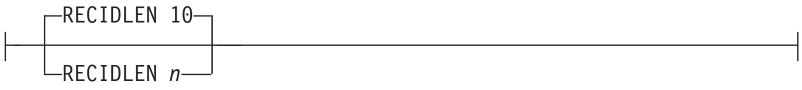
d. Use the **TRCREF** command to define the SBCS font as 0 and the DBCS font as 1. Do no specify a **FONT** subcommand on the **LAYOUT**, **FIELD**, and so forth commands, when using this method. This method is for use with a traditional page definition only. For example:

```
Pagedef sosiL1 replace yes;
  FONT sb1 GT10 SBCS;
  FONT db1 M40F DBCS;
  PAGEFORMAT PF1;
    TRCREF 0 FONT sb1;
    TRCREF 1 FONT db1;
    LAYOUT 'L2';
```

2. You cannot mix Data Object fonts (defined with the **DOFONT** command) with normal FOCA fonts (defined with the **FONT** command) in the page definition in any but the first method of specifying SOSI fonts. That is only when you specify both fonts on the placement command.

For additional information about using SOSI characters, see the *AFP Programming Guide and Line Data Reference*, S544-3884.

RECIDLEN



Specifies the length of the Record Descriptor ID in bytes. This is also known as the “LAYOUT name”. If the **RECIDLEN** parameter is not coded on a **PAGEFORMAT** command, it inherits the value from the specified or default value on the page definition. If the **RECIDLEN** parameter is not coded on a **PAGEDEF** command, the default length is 10 bytes.

Notes:

1. Use the **RECIDLEN** keyword on Record Format page definition only.
2. This parameter can only be used in a Record Format page definition.

n Specifies that the 'record ID' on the **LAYOUT** command is to be "*n*" bytes long. The allowable value of "*n*" is 1 to 250. UTF-16 data characters are 2 bytes long allowing up to 125 UTF-16 characters. Any 'record ID' on a **LAYOUT** command that is less than this length is padded to the specified length with blanks of the type specified or defaulted in the **UDType** subcommand on the **PAGEDEF** command. A 'record ID' that is longer than "*n*" is flagged as an error by PPFA and no page definition is generated.

Note: If the User Data Type (UDType) is **UTF16** and this number is odd, it will be rounded up to the next even number.

Code Example:

In the following example, User Data Type **UTF16** and **RECIDLEN 24** are specified on the **PAGEDEF** command and the **RECIDLEN 26** is specified on the second **PAGEFORMAT** command (pf2).

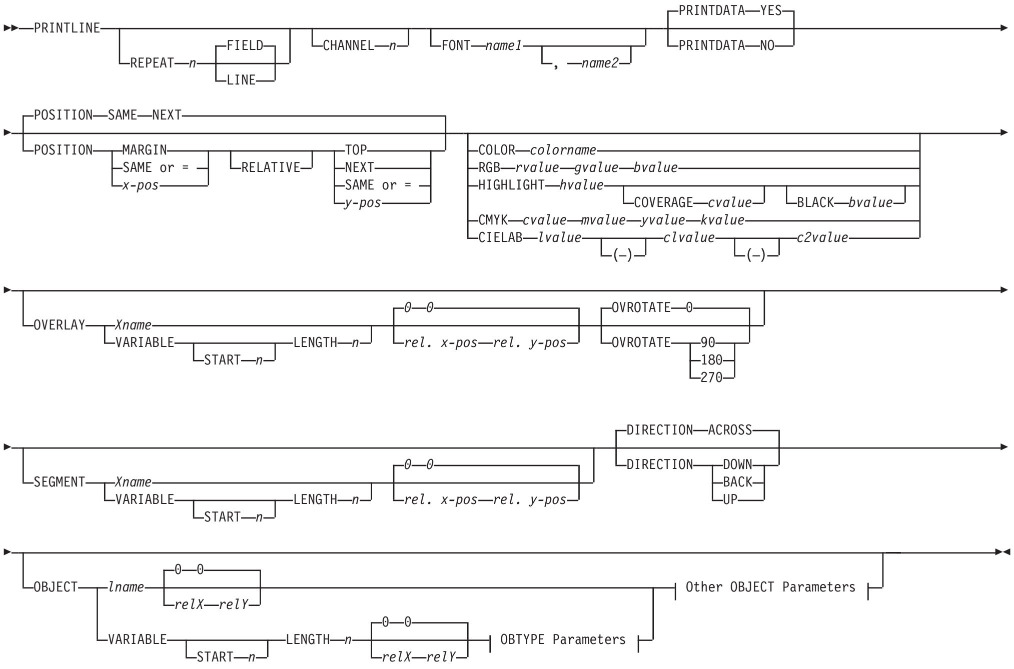
For the two page formats "pf1" and "pf2".

1. "pf1" inherits a **RECIDLEN** of 24 bytes from the page definition, and the User Data Type for the entire page definition is UTF-16.
   a. The **LAYOUT** name 'Long Name 1' is translated to UTF-16 and padded to 24 bytes with UTF-16.
   b. The delimiter '/' on the **LAYOUT** is translated to UTF-16.
   c. The **FIELD** command text 'abcd' is translated to UTF-16.
2. "pf2" specifies a **RECIDLEN** fo 26 bytes and gets **UDType** UTF-16 from the page definition.
   a. The **LAYOUT** name 'Long Name 2' is translated to UTF-16 and padded to 26 bytes with UTF-16.
   b. The **CONDITION** command text 'ABCDEFGH' is translated to UTF-16. Note that the field length of the 8 character string is 16 bytes because each character is 2 bytes long.

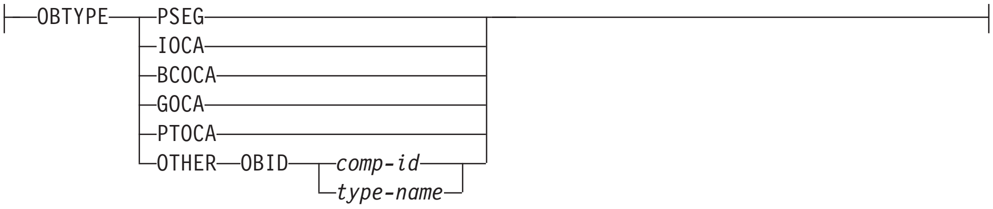
```
PAGEDEF xmp1  UDType UTF16  RECIDLEN 24  REPLACE yes;

   FONT  comp  a075nc TYPE UNICODE
   FONT  comp2 a075bg TYPE UNICODE

   PAGEFORMAT pf1;
     LAYOUT    'Long Name 1' DELIMITER '/'  Position 2 1 FONT comp;
       FIELD  TEXT 'abcd'         Position 2.5 1.5,

   PAGEFORMAT pf2 RECIDLEN 26;
     LAYOUT    'Long Name 2'      POSITION 2 1 FONT comp2;
       CONDITION cn1 START 13 Length 16
          WHEN EQ 'ABCDEFGH'  NULL Pageformat pf1;
```

PRINTLINE Command

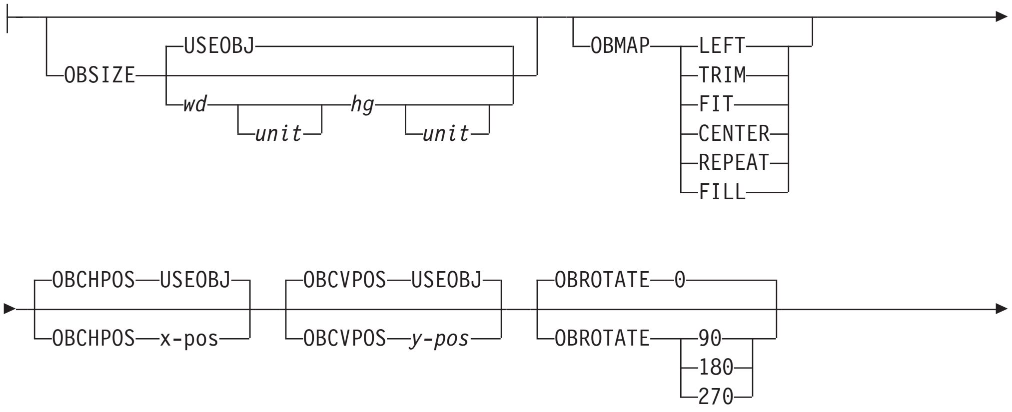
PRINTLINE Command (Traditional)



OBTYPE Parameters:



Other OBJECT Parameters:



```
►─┬─────────────────────────┬─┬──────────────┬─┬──────────────────────────────┬──────────┤
  └─OBCOLOR──color-name─────┘ └─OBPAGE──n────┘ └─OBRESOLUTION──x──y──┬─IN─┬──┘
                                                                      └─CM─┘
```

PRINTLINE The **PRINTLINE** command specifies the printing of one data record on a line. If a *formatted* printline is to be printed, one or more **FIELD** commands must follow the governing **PRINTLINE** command; at least one is required. If this is not done, field processing is not performed and the unformatted data is printed.

Note: The **PRINTLINE** command defines a "traditional" page definition and cannot be mixed with **LAYOUT** commands which define "Record Formatting" page definitions or **XLAYOUT** commands which define "XML" page definitions.

Subcommands

REPEAT

```
├──┬─────────────────────────┬──────────────────────────────────────┤
   │            ┌─FIELD─┐    │
   └─REPEAT──n──┤       ├────┘
                └─LINE──┘
```

Specifies the number of printlines that are to be printed on a logical page. The direction and font specified within this printline applies to all lines printed. By using this command, you do not have to write specifications for each line.

Note: If the **REPEAT** subcommand is omitted, only one line is printed for this **PRINTLINE** command.

n This value specifies the number of printlines for a logical page; the maximum value is 65,535.

REPEAT 0	Not valid
REPEAT 1	Only one line is printed

If the **CHANNEL** or **POSITION** subcommands are specified within this **PRINTLINE** command, they apply only to the first line.

If this **PRINTLINE** is followed by several **FIELD** commands, the related field controls are also repeated.

FIELD Specifies that fields associated with repetitions of this **PRINTLINE** are to be positioned based on the first instance of the same field.

This parameter has no affect in fields with the same direction as the **PRINTLINE** of which they are a part.

This parameter specifies that the direction of repetition—for a given field—is the direction of the first instance of this field, plus 90°. Therefore, every field of an **ACROSS PRINTLINE** is repeated down the page, *regardless of the direction of the* **FIELD**.

LINE
Specifies that fields associated with repetitions of this printline are to be positioned based on the repetition of the **PRINTLINE** itself.

This parameter has no effect in fields with the same direction as the **PRINTLINE** of which they are a part.

This parameter specifies that the direction of repetition—for a given field—is the direction of the associated **PRINTLINE** plus 90°. Therefore, every field of an **ACROSS PRINTLINE** is repeated down the page, *regardless of the direction of the* **FIELD**.

CHANNEL *n*

```
├──┬─────────────┬──────────────────────────────────────────┤
   └─CHANNEL──n──┘
```

Used to specify line spacing, skipping within a logical page, or page ejection (skipping to a new page). This subcommand is equivalent to the Forms Control Buffer (FCB) channel.

n The range of channels is 1 to 12. These correspond to carriage-control characters in the data. There is no default.

FONT

```
├──┬─────────────────────────────────┬──────────────────────┤
   └─FONT──name1──┬──────────────┬───┘
                  └─, ──name2────┘
```

Defines the font to be used for the printline.

name1 Specifies the name of a font used to print the data. This font must have been defined in a previous **FONT** command in this page definition.

If Shift-Out, Shift-In (SOSI) processing is used, *name1* must be the single-byte font.

name2 Specify only when using Shift-Out, Shift-In (SOSI) processing to dynamically switch between a single-byte font and a double-byte font within the printline. *name2* must be the double-byte font.

Notes:

1. If this subcommand is not specified and TRC (Table Reference Character) bytes are specified in the print data, the print server uses the font indicated by the TRC byte. Otherwise, the print server selects a default font.
2. For **ASCII**, **UTF8**, or **UTF16** the entire **PRINTLINE** command must be one font. To use multiple font mappings for a line in **ASCII**, **UTF8**, or **UTF16** you must use the **FIELD** command.

PRINTDATA

```
   ┌PRINTDATA──YES┐
├──┤              ├──────────────────────────────────────┤
   └PRINTDATA──NO─┘
```

Specifies whether the line of data associated with the current **PRINTLINE** should be printed. The **PRINTDATA** subcommand is useful when the data stream is interspersed with lines of comments, blank lines, or lines without data that are not meant to be printed.

YES Specifies the data for the current **PRINTLINE** is printed. **YES** is the default.

NO Specifies the data for the current **PRINTLINE** is not printed.

Note: Any **FIELD** command that is associated with a **PRINTLINE** that specifies **PRINTDATA NO** is ignored and an error message is issued.

The default position for a **YES** command that specifies **PRINTDATA NO** is position same same.

```
PAGEDEF  xmp01 ;
  SETUNITS  LINESP  1  LPI ;

  PRINTLINE ;
  PRINTLINE  PrintData  NO ;
  PRINTLINE  PrintData  yes ;
  PRINTLINE ;
  PRINTLINE  Segment X  PrintData NO  Overlay Y  Position Same Next ;
  PRINTLINE  PrintData yes ;
```

Figure 118. **PRINTLINE NO** *example*

The **LINESP** parameter specifies that one line per inch is to be printed.

1. The first line of data is read and printed.
2. The second line of data is read, but not printed.
3. The third line of data is read and printed one inch down from the first line.
4. The fourth line of data is read and printed one inch down from the third line.
5. The fifth line of data is read, but not printed.
   - The segment X is printed.
   - The overlay Y is printed.
6. The sixth line of data is read and printed two inches down from the fourth line.

Note: The data line 2 was not printed and did not affect the positioning of the lines that followed. Line 3 was positioned as though line 2 did not exist.

POSITION

```
   ┌─POSITION──SAME──NEXT────────────────────────────────────┐
├──┼─────────────────────────────────────────────────────────┼──────┤
   └─POSITION──┬─MARGIN──────┬──┬──────────┬──┬─TOP───────┘
               ├─SAME or = ──┤  └─RELATIVE─┘  ├─NEXT──────┤
               └─x-pos───────┘                ├─SAME or = ─┤
                                              └─y-pos─────┘
```

Specifies the starting position of the printline in the printout.

horizontal position

x-pos	Specifies the horizontal offset from the left side of the logical page. The value is a number with up to three decimal places. The valid options for *x-pos* are described in the **SETUNITS** command for the horizontal value.
MARGIN	Specifies this line starts at the position specified as the horizontal (*x*) value in the previous **LINEONE** subcommand within this page definition.
SAME	Specifies this line starts at the same horizontal offset position as the previous printline. If applied to the first printline of a logical page, the horizontal position is **0**, which is the default.
=	Alternate for **SAME**.
RELATIVE	Specifies that the following vertical position value is to be processed as a relative value. The printline is positioned relative to the last printline placed on the page. If a set of printlines were skipped over in the page definition because of a skip-to-channel carriage control, and the new active printline contains a relative vertical position, the output line is positioned relative to the location of the last line printed on the page. **Note:** If both **TOP** and **RELATIVE** are requested for the Y position value, the **RELATIVE** request is ignored. When using **RELATIVE** positioning, PPFA does not flag off-the-page conditions for the position of a printline or for any overlays, segments or objects placed relative to that printline. Printlines that fall outside the bounds of the logical page are flagged by the print server at run time. When specifying **RELATIVE**, use the minus sign to indicate any negative values for the **PRINTLINE** vertical position; you may use the plus sign to indicate positive values. If no sign is used, a positive value is assumed. The **DIRECTION** for a relative printline must be **ACROSS**. Fields associated with a relative printline must have the same

DIRECTION as the printline and must match the **PAGEFORMAT DIRECTION**.

If **RELATIVE** is specified with “**SAME**” or “=” as the *y* value, the relative value in the printline is +0.

Relative positioning is allowed on a **PRINTLINE** command only if the **PRINTLINE** and all its associated **FIELD** commands are formatted to print in the same direction as the **PAGEFORMAT**. That is, the **DIRECTION** parameter in the **PRINTLINE** and any associated **FIELD** commands must specify (or default to) ACROSS. The **DIRECTION** in the **PAGEFORMAT** or **PAGEDEF** command may be any allowable value: **ACROSS**, **DOWN**, **BACK**, or **UP**.

The **PRINTLINE** command in which relative positioning is used can specify a **CHANNEL** parameter. The *n* value specified for the **CHANNEL** parameter cannot be used for any other **PRINTLINE** in the same **PAGEFORMAT**.

```
setunits linesp 6 lpi;
PAGEDEF rel9  replace yes
  direction across width 8.5 in height 11.0 in;
PRINTLINE channel 1 repeat 7 position 0 IN 1.0 IN;

/* The fields will be placed at +120 pels, +24 pels (next) */
/* and +48 pels (.20 IN) from lines previously placed on page

setunits linesp 10 lpi;
PRINTLINE channel 2 repeat 2 position 0 relative next;
  FIELD START 1 LENGTH 3 position 0 IN .5 IN;
  FIELD START 4 LENGTH 3 position 0 IN next;
  FIELD START 7 LENGTH 3 position current .20 IN;
```

vertical position

y-pos	Specifies the vertical offset from the top side of the logical page. The value options for *y-pos* are described in the **SETUNITS** command for the vertical value.
TOP	Specifies that the printline is placed in the position specified as the vertical (*y*) value in the previous **LINEONE** subcommand within this page definition.
NEXT	Specifies the **PRINTLINE** is to be positioned down (on the logical page) one line (as defined in the **LINESP** subcommand of the last **SETUNITS** command) from the previous **PRINTLINE**. The **LINESP** subcommand of the **SETUNITS** command establishes the distance from one line to the next.

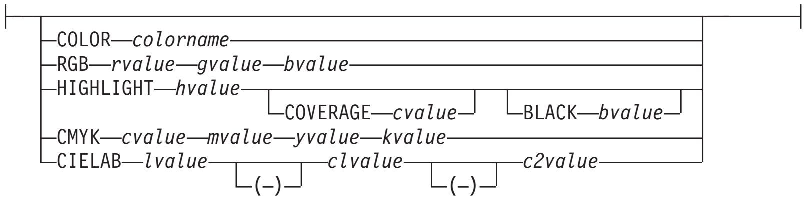
When **NEXT** is specified for the first **PRINTLINE** of a logical page, the starting position of the line is one line down from the top of the logical page, which is the default.

Note: The "down" direction is determined by the direction of the logical page (as specified in the page format), not the printline direction. **NEXT** is, therefore, mainly useful in **ACROSS** printlines.

SAME Specifies this printline starts at the same vertical position as the previous printline. If applied to the first printline of a logical page, the horizontal position is **0**, which is the default.

= Alternate for **SAME**.

COLOR *colorname*



Specifies an OCA or defined color for the text of this field. This subcommand is recognized only by printers that support multiple-color printing. Refer to your printer publication for information about the colors that can printed.

Note: See Chapter 8, "AFP Color Management," on page 173 for more information about using color.

colorname Values for *colorname* can be a defined color (see "DEFINE COLOR Command" on page 313), or an OCA *colorname*. Values for OCA *colornames* are:

NONE
DEFAULT
BLACK
BLUE
BROWN
GREEN
RED
PINK (or **MAGENTA**)
TURQ (or CYAN)
YELLOW
DARKBLUE (or **DBLUE**)
ORANGE
PURPLE
MUSTARD
GRAY
DARKGREEN (or **DGREEN**)
DARKTURQ (**DTURQ**, or **DCYAN**, or **DARKCYAN**)

The color choices depend on the printer.

If you do not enter one of these colors, the default color for that printer is used. **NONE** is the color of the medium. **DEFAULT** is the printer default color.

Note: In some printer manuals, the color turquoise (**TURQ**) is called "cyan", and the color pink (**PINK**) is called "magenta".

PPFA supports the following synonyms:
- **CYAN** for **TURQ**
- **DARKCYAN**N for **DARKTURQ**
- **DBLUE** for **DARKBLUE**
- **DCYAN** for **DARKTURQ**
- **DGREEN** for **DARKGREEN**
- **DTURQ** for **DARKTURQ**
- **MAGENTA** for **PINK**

Color Models

Specifies the color of print for this field supported in MO:DCA for the Red/Green/Blue color model (**RGB**), the highlight color space, the Cyan/Magenta/Yellow/Black color model (**CMYK**), and the **CIELAB** color model.

RGB *rvalue gvalue bvalue*

Three **RGB** integer values are used. The first (*rvalue*) represents a value for red, the second (*gvalue*) represents a value for green, and the third (*bvalue*) represents a value for blue. Each of the three integer values may be specified as a percentage from 0 to 100.

Note: An **RGB** specification of 0/0/0 is black. An **RGB** specification of 100/100/100 is white. Any other value is a color somewhere between black and white, depending on the output device.

HIGHLIGHT *hvalue* **COVERAGE** *cvalue* **BLACK** *bvalue*

Indicates the highlight color model. Highlight colors are device dependent.

You can use an integer within the range of 0 to 65535 for the *hvalue*.

Note: An *hvalue* of 0 indicates that there is no default value defined; therefore, the default color of the presentation device is used.

COVERAGE indicates the amount of coverage of the highlight color to be used. You can use an integer within the range of 0 to 100 for the *cvalue*. If less than 100 percent is specified, the remaining coverage is achieved with the color of the medium.

Note: Fractional values are ignored. If **COVERAGE** is not specified, a value of 100 is used as a default.

BLACK indicates the percentage of black to be added to the highlight color. You can use an integer within the range of 0 to 100 for the *bvalue*. The amount of black shading applied depends on the **COVERAGE** percentage, which is applied first. If less than 100 percent is specified, the remaining coverage is achieved with black.

Note: If **BLACK** is not specified, a value of 0 is used as a default.

CMYK *cvalue mvalue yvalue kvalue*

Defines the cyan/magenta/yellow/black color model. *Cvalue* specifies the cyan value. *Mvalue* specifies the magenta value. *Yvalue* specifies the yellow value. *Kvalue* specifies the black value. You can use an integer percentage within the range of 0 to 100 for any of the **CMYK** values.

CIELAB *Lvalue* **(−)***c1value* **(−)***c2value*

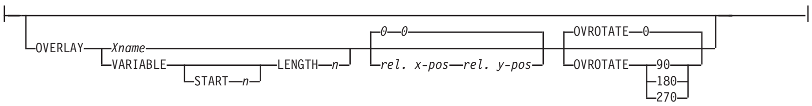
Defines the **CIELAB** model. Use a range of 0.00 to 100.00 with *Lvalue* to specify the luminance value. Use signed integers from −127 to 127 with *c1value* and *c2value* to specify the chrominance differences.

Lvalue, *c1value*, *c2value* must be specified in this order. There are no defaults for the subvalues.

Note: Do not specify both an **OCA** color with the **COLOR** sub-parameter and an extended color model on the same **FIELD** or **PRINTLINE** command. The output is device dependent and may not be what you expect.

Do not specify two extended **COLOR** subcommands on the same **FIELD** or **PRINTLINE** command.

OVERLAY



Specifies the name of an overlay that is to be positioned relative to the location specified in the **PRINTLINE** command in which the **OVERLAY** subcommand was named. The **PAGEFORMAT OVERLAY** command may contain the named overlays. The maximum number of overlays specified for a **PAGEFORMAT** including the **PRINTLINE OVERLAY** subcommand is 254.

The **OVERLAY** can be identified by specifying a name (*xname*) or by getting the name from the input data record (use **VARIABLE** command).

Xname The user access name (external name). It can be unquoted or quoted with descriptor tags, indicating the data type (for example, ASCII) of the data in the field.

unquoted-name

An unquoted external name can be up to 6 characters. It is folded to upper case, has an “O1” prefix added to it, and is translated to EBCDIC codepage 500 if necessary.

quoted-name with no data tag

A quoted external name can be up to 8 characters. No translation is done. It is the data type (EBCDIC or ASCII) as dictated by the system platform. If not 8 bytes long, it is padded on the right with EBCDIC or ASCII blanks.

C'quoted-name'
This quoted external name can be up to 8 characters. No translation is done. It is the data type (EBCDIC or ASCII) as dictated by the system platform. If not 8 bytes long, it is padded on the right with EBCDIC or ASCII blanks.

E'quoted-name'
This quoted external name can be up to 8 characters. It is translated, if necessary, to EBCDIC and padded with EBCDIC blanks if it isn't 8 bytes long.

A'quoted-name'
This quoted external name can be up to 8 characters. It is translated, if necessary, to ASCII and padded with ASCII blanks if it isn't 8 bytes long.

X'hex-digit-pairs'
This quoted external name can be up to 8 characters (16 hexadecimal digits). No translation is done. If less than 8 characters are coded, the name is padded on the right with blanks of the platform type where the page definition is generated (ASCII on AIX and Windows NT; EBCDIC otherwise). The user can avoid the padding by coding all 16 hexadecimal digits.

VARIABLE Indicates that the actual name of the overlay, including the O1 prefix, is read from the data record. The **Variable-Name-Locator** field specifies where in the data to get the name.

Notes:

1. Any overlay that is to be included in this manner must be defined in the **PAGEFORMAT** using the **OVERLAY** command. Any overlay included but not defined will cause a run time print error for a missing MPO structured field, for example APS263I
2. If you specify **VARIABLE** for the **OVERLAY** name and don't want to print the name, then you must have at least one field command, or code **PRINTDATA NO** on the **PRINTLINE** command.

START *n*	The starting position in the data record to get the overlay name. The first data byte position of the input record is 1. If **START** is not coded, 1 is assumed.
LENGTH *n*	Length of field. Specifies the number (*n*) of bytes to process from the data record, beginning with the position specified in **START**. The maximum length is 8.

OVROTATE {0 | 90 | 180 | 270}

Specifies the rotation of the placed overlay with respect to the *x-axis* of the page.

See “FORMDEF Command” on page 257 for an **OVROTATE** example, which is presented in the **FORMDEF** description.

SEGMENT

```
├──┬───────────────────────────────────────────────────────────────┬──┤
   │                                           ┌─0──0──────────────┐ │
   └─SEGMENT──┬─Xname──────────────────────────┼───────────────────┼─┘
              └─VARIABLE──┬────────┬─LENGTH──n─┘ └─rel. x-pos──rel. y-pos─┘
                          └─START──n─┘
```

Specifies the placement of a segment relative to the location specified in the **PRINTLINE** command in which the **SEGMENT** subcommand was named. The **PAGEFORMAT SEGMENT** command may contain the named segments. The maximum number of segments specified for a **PAGEFORMAT** including the **PRINTLINE SEGMENT** subcommand is 127.
The **SEGMENT** can be identified by specifying a name (*Xname)* or by getting the name from the input data record using **VARIABLE Variable-Name-Locator**.

Xname Specifies the user-access name as defined in the **SEGMENT** command. It can be unquoted or quoted with descriptor tags within indicate the data type of the data in the field.

unquoted-name
An unquoted external name can be up to 6 characters. It is folded to upper case, have an “O1” prefix added to it, and be translated to EBCDIC codepage 500 if necessary.

quoted-name with no data tag
A quoted external name can be up to 8 characters. No translation is done. It is the data type (EBCDIC or ASCII) as dictated by the system platform. If not 8 bytes long, it is padded on the right with EBCDIC or ASCII blanks.

C'quoted-name'
A quoted external name can be up to 8 characters. No translation is done. It is the data type (EBCDIC or ASCII) as dictated

by the system platform. If not 8 bytes long, it is padded on the right with EBCDIC or ASCII blanks.

E'quoted-name'

This quoted external name can be up to 8 characters. It is translated, if necessary, to EBCDIC and padded with EBCDIC blanks if it isn't 8 bytes long.

A'quoted-name'

This quoted external name can be up to 8 characters. It is translated, if necessary, to ASCII and padded with ASCII blanks if it isn't 8 bytes long.

X'hex-digit-pairs'

This quoted external name can be up to 8 characters (16 hexadecimal characters). No translation is performed. If less than 8 characters are coded, the name is padded on the right with blanks of the platform type where the page definition was generated (ASCII on AIX and NT or EBCDIC otherwise). You can avoid the padding by coding all 16 hexadecimal digits.

VARIABLE

Indicates that the actual name of the segment, including the S1 prefix, is read from the data record. The **Variable-Name-Locator** field specifies where in the data to get the name.

Notes:

1. Any page segment that is to be included in this manner should be defined in the **PAGEFORMAT** using the **SEGMENT** command. Defining page segments will enhance print performance.
2. If you specify **VARIABLE** for the **SEGMENT** name and don't want to print the name, then you must have at least one field command, or code **PRINTDATA NO** on the **PRINTLINE** command.

Note:

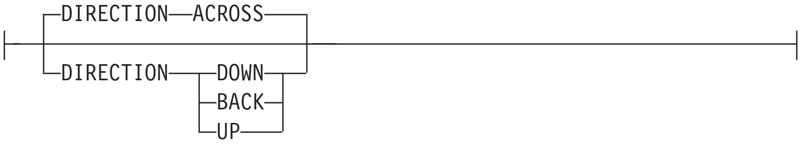
START *n*

The starting position in the data record to get the overlay name. The first data byte position of the input record is 1. If **START** is not coded, 1 is assumed.

LENGTH *n*

Length of field. Specifies the number (*n*) of bytes to process from the data record, beginning with the position specified in **START**. The maximum length is 8.

DIRECTION

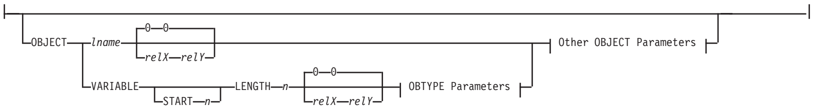


Specifies the print direction of the line relative to the upper-left corner as you view the logical page. Not all printers can print in all print directions. For more information about your printer, refer to your printer documentation.

If **DIRECTION** is not specified, the direction specified in the **PAGEFORMAT** command is used. Observe that this direction is additive to the direction specified in the **PAGEFORMAT** command. See 458.

ACROSS	The printline direction is rotated 0° relative to the direction specified in the **PAGEFORMAT** (the printlines are oriented in the same direction as the page).
DOWN	The printline direction is rotated 90° relative to the direction specified in the **PAGEFORMAT**.
BACK	The printline direction is rotated 180° relative to the direction specified in the **PAGEFORMAT**.
UP	The printline direction is rotated 270° relative to the direction specified in the **PAGEFORMAT**.

OBJECT



Specifies the placement of a resource object. If an internal name is coded, this is a known object defined by an **OBJECT** command. Otherwise, the object is a variable-named object whose name is extracted from fields in the line data as described by the **START**, **LENGTH**, **FLDNUM**, or **RECID** parameters. There is no **OBJECT** command for these objects, they must be specified with the **OBTYPE** and **OBID** parameters.

Notes:

1. All of the **OBJECT** parameters are treated as positional parameters. All positional parameters must be coded in the exact position and order as specified in the syntax diagram.
2. Multiple page/image objects used without specifying a page using **OBPAGE** will default to using the first page in the object.

lname	Specifies the local name of an object that is up to 16 alphanumeric characters in length. The *lname* is used to match the **PRINTLINE OBJECT** subcommand to its definition from the **OBJECT** command. An object must be defined with this internal name by the **OBJECT** command.
relative-xpos relative-ypos	Specifies the number of units (inches, mm, and so

on) that are added to the position of the current printline to position the top-left corner of the object. The values for the horizontal and vertical positioning are limited by the type of printer used and the L-units specified with the **PELSPERINCH** parameter on the **PAGEDEF** or **PAGEFORMAT** command.

Each position specification can be a positive or negative number with up to three decimal places. The units specified can be one of the following: **IN**, **MM**, **CM**, **POINTS**, or **PELS**.

VARIABLE Indicates that the actual name of the object is read from the data record. The **Variable-Name-Locator** field specifies where in the data to get the name.

Notes:

1. Any object that is to be included in this manner should be defined in the **PAGEDEF** using the **OBJECT** command. Defining objects will enhance print performance.
2. If you specify **VARIABLE** for the **OBJECT** name and don't want to print the name, then you must have at least one field command, or code **PRINTDATA NO** on the **PRINTLINE**command.

START *n* The starting position in the data record to get the object name. The first data byte position of the input record is 1. If **START** is not coded, 1 is assumed.

LENGTH *n* Length of field. Specifies the number (*n*) of bytes to process from the data record, beginning with the position specified in **START**. The maximum length is 8.

OBTYPE

```
├──OBTYPE──┬─PSEG───────────────────────┬──────────┤
           ├─IOCA───────────────────────┤
           ├─BCOCA──────────────────────┤
           ├─GOCA───────────────────────┤
           ├─PTOCA──────────────────────┤
           └─OTHER──OBID──┬─comp-id───┬─┘
                          └─type-name─┘
```

Used to specify the type of the object. Observe that each of the object types restricts the type of mapping option allowed in the placement of the object (**OBMAP** on the **OBJECT** subcommand on the **PRINTLINE** command.)

PSEG Specifies a page segment object, as described in the *Mixed Object Document Content Architecture (MODCA) Reference Manual*. All mapping types (**OBMAP**) are allowed by PPFA, however, the print server issues an error if any of the objects contained in the page segment are not compatible with the coded **OBMAP** parameter.

GOCA
Specifies a graphic object, as described in the *Graphics Object Content Architecture (GOCA) Reference Manual*. **GOCA** allows you to specify **TRIM**, **FIT**, **CENTER**, **REPEAT**, and **FILL** parameters on the **OBMAP** subcommand.

BCOCA
Specifies a bar code object, as described in the *Bar Code Object Content Architecture (BCOCA) Reference Manual*. **BCOCA** allows you to specify only the **LEFT** parameter on the **OBMAP** subcommand.

IOCA Specifies an image object, as described in the *Image Object Content Architecture (BCOCA) Reference Manual*. **IOCA** allows you to specify **TRIM**, **FIT**, **CENTER**, **REPEAT**, and **FILL** parameters on the **OBMAP** subcommand.

PTOCA
Specifies a presentation text object with Object Environment Group (OEG) as described in the *Presentation Text Object Content Architecture (PTOCA) Reference Manual* and the *Mixed Object Document Content Architecture (MODCA) Reference Manual*. The **PTOCA** object type allows you to specify the **LEFT** parameter in the **OBMAP** subcommand.

OTHER
Specifies other object data. The object data to be included is a paginated presentation object with a format that may or may not be defined by an AFP presentation architecture. When you specify **OTHER**, you must also specify the **OBID** parameter. **OTHER** allows you to specify **TRIM**, **FIT**, **CENTER**, **REPEAT**, and **FILL** parameters on the **OBMAP** subcommand.

OBID Specifies either a component identifier or a type name from Table 18 on page 480. The **OBID** is translated into an Encoded OID and matched to the OID inside the object; they must match.

component-id	Specifies the component identifier.
type-name	The name chosen by PPFA

as an alternative to coding a component identifier.

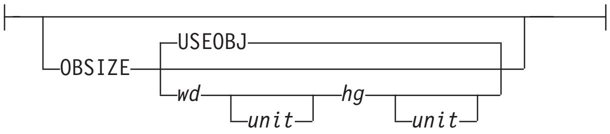
Table 18. Non-OCA Objects supported by IOB

Type-Name	Component-id	Description of OBID Object Type
EPS	13	Encapsulated PostScript
TIFF or TIF	14	Tag Image File Format
WINDIB	17	Device Dependent Bit Map [DIB], Windows Version
OS2DIB	18	Device Dependent Bit Map [DIB], PM Version
PCX	19	Paint Brush Picture File Format
GIF	22	Graphics Interchange Format
JFIF, JPEG, or JPG	23	AFPC (AFP Consortium) JPEG Subset
PDFSPO	25	PDF Single Page Object
PCLPO	34	PCL Page Object
EPSTR	48	EPS with Transparency
PDFSPOTR	49	PDF Single Page Object with Transparency
MTIFF	61	TIFF Multiple Image File
MTIFFNT	62	TIFF Multiple Image without Transparency File
MPDF	63	PDF Multiple Page File
MPDFT	64	PDF Multiple Page with Transparency File
PNG	65	PNG File Format
AFPCTIFF	66	AFPC TIFF subset

Table 19. Object Types that can be referenced as Secondary Resources

Type-Name	Component-id	Description of OID Type-Name
PDFRO	26	PDF Resource Object (new)
RESCLRPRO	46	Resident Color Profile Resource Object
IOCAFS45RO	47	IOCA FS45 Resource Object Tile (new)

OBSIZE



Specifies the size of the object placement area. When no **OBSIZE** is specified, the default is the size specified in the object. If no size is specified in the object, the size of the page is used. The page width is as specified on the **PAGEDEF** or **PAGEFORMAT** commands, or it defaults to 8.3 inches by 10.8 inches.

wd Specifies the width of an object placement area as a number with up to three decimal places. The allowable width may vary with the type of printer used and the L-units specified with the **PELSPERINCH** parameter on the **PAGEDEF** or **PAGEFORMAT** command.

hg Specifies the height of the object placement area as a number with up to three decimal places. The allowable height may vary with the type of printer used and the L-units specified with the **PELSPERINCH** parameter on the **PAGEDEF** or **PAGEFORMAT** command.

unit Specifies a unit of measurement for the width parameter. The choices are: **IN**, **MM**, **CM**, **POINTS**, or **PELS**.

Note: If no unit is specified, the default is the most recent **SETUNITS** command value or **IN** (inch) if a **SETUNITS** command has not been issued.

USEOBJ

Specifies that the size measurements specified in the object are to be used. If no size is specified in the object, the size of the page is used, which is the length and width as specified on the **PAGEDEF** or **PAGEFORMAT** commands, or it defaults to 8.3 inches by 10.8 inches.

OBMAP

```
├──┬──────────────────────┬──────────────────────────┤
   └─OBMAP──┬─LEFT───┬─┘
            ├─TRIM───┤
            ├─FIT────┤
            ├─CENTER─┤
            ├─REPEAT─┤
            └─FILL───┘
```

Specifies mapping options. The **OBMAP** parameter defines the mapping of the object to the object placement area. If **OBMAP** is not coded, the mapping option within the object is used. If the object does not contain a mapping option, then the print server sets it to the created default for the container type.

Each object type (**OBTYPE** on the **OBJECT** command) specifies the allowable mapping options for that type. When it can, PPFA issues a message when these rules are violated. However, in the case of an object type of page segment (**OBTYPE=PSEG**), PPFA does not know what types of objects are contained in it; therefore, PPFA cannot enforce the restrictions. See “OBJECT Command” on page 423 for a description of the restrictions.

LEFT	Specifies that the object is positioned at the upper, left-hand corner of the object placement area, as defined or defaulted by the *relative-xpos*, *relative-ypos*, **OBCHPOS**, and **OBCVPOS** parameters. Any portion of the object that falls outside the object placement area as defined by the **OBSIZE** parameter is not trimmed and could cause an exception condition by the presentation system.
TRIM	Specifies position and trim. The object is positioned at the upper, left-hand corner of the object placement area, as defined or defaulted by the *relative-xpos*, *relative-ypos*, **OBCHPOS**, and **OBCVPOS** parameters. Any portion of the object that falls outside the object placement area as defined by the **OBSIZE** parameter is trimmed.
FIT	Specifies scale to fit; this is the default value if the **OBMAP** parameter is not coded. The object is to be scaled to fit within the object placement area, as defined by the **OBSIZE** parameter. The center of the object is placed in the center of the object placement area and the object is scaled up or down to fit the block. Scaling in the horizontal and vertical directions is symmetrical. The **FIT** parameter ensures that all of the data in the object is presented in the object placement area at the largest possible size. The object is not trimmed.
CENTER	Specifies that the center of the object be positioned at the center of the object placement area. Any portion of the object that falls outside the object placement area is trimmed.
REPEAT	Specifies that the origin of the data object be positioned with the origin of the object placement area. The object is then replicated in the X and Y directions. If the last replicated data does not fit in the object area, it is trimmed to fit.

FILL	Specifies that the center of the data object be positioned coincident with the center of the object placement area. The data object is then scaled, so that it totally fills the object placement area in both the X and Y directions. This may require that the object be asymmetrically scaled by different scale factors in the X and Y directions.

OBCHPOS

```
    ┌─OBCHPOS──USEOBJ─┐
├───┤                 ├─────────────────────────┤
    └─OBCHPOS──x-pos──┘
```

Specifies the horizontal offset of the object contents within the object placement area.

x-pos	The valid options for *x-pos* are described in the **SETUNITS** command for the horizontal value.
USEOBJ	Specifies that the offset value from the object is to be used. If no value is set in the object, the value defaults to **0**.

OBCVPOS

```
    ┌─OBCVPOS──USEOBJ─┐
├───┤                 ├─────────────────────────┤
    └─OBCVPOS──y-pos──┘
```

Specifies the vertical offset of the object contents within the object placement area, as defined by the **OBSIZE** parameter. If **OBCVPOS** is not specified, it defaults to **USEOBJ** and uses the value set in the object. If no value is set in the object, the value defaults to **0**. The **OBCHPOS** parameter is used only in **LEFT** and **TRIM** mapping of the object into the object placement area.

y-pos	Specifies a positive or negative number. The valid options for *y-pos* are described in the **SETUNITS** command for the vertical value.
USEOBJ	Specifies that the offset value from the object is to be used. If no value is set in the object, the value defaults to **0**.

OBROTATE {0 | 90 | 180 | 270}

```
   ┌─OBROTATE──0──────────┐
├──┤                      ├──────────────────────┤
   └─OBROTATE───┬─90──┬───┘
                ├─180─┤
                └─270─┘
```

Specifies the object rotation with respect to the current LND's coordinate system.

Notes:

1. An included object is positioned and oriented in the following manner:
   - All measurements are from the LND position established by the **PRINTLINE** position. Reference these measurements using the inline direction of the printline.
   - Measure the“*relative-xpos* and *relative-ypos*” units from the **PRINTLINE** current position to determine the object area origin.
   - Apply any rotation from **OBROTATE** to modify the **PRINTLINE** axis, and to create the new object area coordinate system.
   - Use the **OBSIZE** parameter to determine the object area size within the object area coordinate system, and to define the object placement area.
   - To determine the object content origin, apply the Object Content Offset from parameters **OBCHPOS** (OBject Content Horizontal Position) and **OBCVPOS** (OBject Content Vertical POSition) to the object area origin.
2. The object content offset is used only for position (**LEFT**) and position and trim (**TRIM**) mapping options.

OBCOLOR *colorname*

```
├──┬──────────────────────┬──────────────────────┤
   └─OBCOLOR──color-name──┘
```

Specifies the color to be used as the default color or initial color for the object placement area. The **OBCOLOR** parameter is used only for objects of the **PSEG**, **GOCA**, **BCOCA**, and **IOCA** type. If the object type is **OTHER**, this parameter is ignored.

colorname Values for *colorname* can be a defined color (see “DEFINE COLOR Command” on page 313) or one of the **OCA** color spaces listed below.

NONE
DEFAULT
BLACK
BLUE
BROWN
GREEN

RED
PINK (or **MAGENTA**)
TURQ (or **CYAN**)
YELLOW
DARKBLUE (or **DBLUE**)
ORANGE
PURPLE
MUSTARD
GRAY
DARKGREEN (or **DGREEN**)
DARKTURQ (or **DTURQ**)
DARKCYAN (or **DCYAN**)

Note: This function requires both the print server and printer support. Check your print server and printer documentation.

OBPAGE

```
├──┬───────────┬──────────────────────────┤
   └─OBPAGE──n─┘
```

Specifies the page number of a multipage object or file to be presented. ***n*** is the page number. A number from 1 to 999999999 (9 digits) is valid.

OBRESOLUTION

```
├──┬─────────────────────────────┬─────────┤
   └─OBRESOLUTION──x──y──┬─IN─┬─┘
                         └─CM─┘
```

Specifies the resolution and unit of measurement of an image. If the resolution is already specified inside the image, this information is ignored by the printer. Use this subcommand for images that do not or may not contain their resolution. Specify resolution of an image so that the printer can print the image correctly.

To specify object resolution, you must have a printer and a print server that support this capability.

If not specified, the default is to assume that the image resolution is the same as the printer. If the image does not print at the size you expect, use **OBRESOLUTION** to identify the image's resolution. With the resolution information, the printer will then be able print the image at the expected size.

x-res Specifies the number to be used for the horizontal resolution of an image. Specify an integer value in the range of 1-3276.

y-res Specifies the number to be used for the vertical resolution of an image. Specify an integer value in the range of 1-3276.

unit	Specifies a unit of measurement. The choices are: **IN** Inch **CM** Centimeter

Code Example:

In the following example, the **OBJECT** subcommand is used to define a JFIF object (which may be specified as JPG). This object has a resolution of 300 pels per inch in both the *x* and *y* directions.

```
Pagedef  obres2 replace yes;

 PRINTLINE  OBJECT VAR  .4 .5 start 2 length 6
            OBTYPE OTHER OBID JPG
            OBRESOLUTION 300 300 IN;
```

In the following example, the page definition pd1 has defined an object with an external name of “PSEGxyz”, of object type **PSEG**. The object has an internal name of “xyzintname”. The internal name identifies the object for the **PRINTLINE OBJECT** subcommand when the object is placed.

```
PAGEDEF pd1 Replace Yes
  COMMENT 'this is my program';

  OBJECT xzZIntName
    OBXNAME PSEGxyz
    OBTYPE  PSEG ;

  PAGEFORMAT pf1;
    PRINTLINE
      OBJECT xyzintname −1.1 in 2.1 in
        OBSIZE 3 in  5 in
        OBMAP FILL
        OBCOLOR BLUE ;
```

Figure 119. Example of PPFA Support for IOB in a **PAGEDEF**

The **PRINTLINE** in **PAGEFORMAT** pf1 places the object on the page 1.1 inches to the left and 2.1 inches below the current printline position. It also maps the object into the object area with the **FILL** parameter, which centers the object in the object area and totally fills the area, possibly with different scaling factors in the X and Y directions. It has an area size of 3 by 5 inches, and overrides the default presentation space color to **BLUE**.

SEGMENT Command

SEGMENT Command

```
►►—SEGMENT—name—;——————————————————————————————————————————►◄
```

Use the **SEGMENT** command only if you want page segments to be loaded to the printer before the page begins printing. If segments are used repeatedly and need to be available in the printer, this eliminates the need to load them each time. However, they do take up raster-pattern storage.

A separate **SEGMENT** command is required for each page segment with a maximum of 127 **SEGMENT** commands within a single page format. For Traditional:

```
PAGEFORMAT
 TRCREF
 SEGMENT
 ...
 SEGMENT
```

For Record Format and XML:

```
PAGEFORMAT
 SEGMENT
 ...
 SEGMENT
```

A **SEGMENT** command is nested within the page format and follows the **PAGEFORMAT** command.

For Traditional: To include a page segment on a page without using an IPS structured field within the user data, see the "PRINTLINE Command" on page 465.

SEGMENT *name*

Specifies the alphanumeric name of 1 to 6 characters (user-access name) of the page segment. Each name must be unique within a single page format.

Note: The prefix "S1" is not part of the six-character user-access name.

SETUNITS Command

SETUNITS Command

```
               ┌─ 1 ──IN── 1 ──IN──────────────────────────┐
►►──SETUNITS───┼───────────────────────────────────────────┼──┬──────────────────────────────┬──;──────►◄
               └─x──┬─────────┬──────y──┬─────────┬────────┘  └─LINESP──n──┬─IN──────┬──────┘
                    ├─IN──────┤         ├─IN──────┤                        ├─MM──────┤
                    ├─MM──────┤         ├─MM──────┤                        ├─CM──────┤
                    ├─CM──────┤         ├─CM──────┤                        ├─POINTS──┤
                    ├─POINTS──┤         ├─POINTS──┤                        ├─PELS────┤
                    ├─PELS────┤         ├─PELS────┤                        └─LPI─────┘
                    └─CPI─────┘         └─LPI─────┘
```

The **SETUNITS** command specifies the value and the unit of measurement that are the defaults for any subsequent measurement parameter in all of the commands and subcommands. These values remain the default values until another **SETUNITS** command is specified. The **SETUNITS** command should be specified as the first command in a page definition. If neither this command nor a measurement parameter is specified, the defaults identified within the following description are used.

SETUNITS Specifies the value and the unit of measurement that are the defaults for any subsequent measurement parameter in all of the commands and subcommands.

x-pos Specifies the number used for horizontal measurement. A number with up to three decimal places is used. The default is **1**. The choices are **IN**, **MM**, **CM**, **POINTS**, **PELS**, or **LPI**. The default is **IN**.

Note: This value affects subsequent **OFFSET** subcommands.

y-pos Specifies the number used for vertical measurement. A number with up to three decimal places is used. The default is **1**. The choices are **IN**, **MM**, **CM**, **POINTS**, **PELS**, or **LPI**. The default is **IN**.

Note: This value affects subsequent **OFFSET** subcommands.

Using CPI and LPI Units of Measurement

The **CPI** and **LPI** units of measurement make it possible to write the following command:

```
SETUNITS 10 CPI 6 LPI ;
```

This command sets the units of measurement for horizontal and vertical spacing in terms of characters per inch and lines per inch. You can then use the **OFFSET** subcommand specifications to increment the spacing one character or one line at a time. The distance specified by *n* characters over and by *n* lines down is defined in the governing **SETUNITS** command. In this example, there are 10 characters per inch (**CPI**) and 6 lines per inch (**LPI**).

Subcommand

LINESP Determines the line density or “leading” of the text. Any unit of measurement can be used.

For Traditional: this subcommand values affects:

- The following **PRINTLINE NEXT** subcommand
- The vertical (*y*) position of the first line on a logical page when the **LINEONE** subcommand is not specified and the default is assumed

The default is **6 LPI**. If **LINESP** is allowed to default to 6 **LPI**, the **LINEONE** default is 1 L-unit less than 80% of 1/6 inch.

For Record Format and XML: this subcommand value affects the **LAYOUT NEXT** subcommand.

n The meaning is determined by the type of unit-of-measurement specified in the unit parameter.

LPI	The number of lines per inch
All others	The distance between lines

unit Specifies a unit of measurement. The choices are:

IN	Inch
LPI	Lines-per-inch
MM	Millimeter
CM	Centimeter
PELS	L-units per inch (The number of L-units per inch can be defined by the user or can default to 240 L-units in an inch)
POINTS	Points per inch (72 points in an inch)

TRCREF Command (Traditional)

TRCREF Command

```
                                 ┌─DIRECTION──ACROSS─────┐   ┌─ROTATION──0──────────┐
►►──TRCREF──┬─────┬──FONT──name──┼───────────────────────┼───┼──────────────────────┼──;──────►◄
            └─n───┘              └─DIRECTION──┬─DOWN─┬───┘   └─ROTATION──┬─90───┬───┘
                                              ├─BACK─┤                   ├─180──┤
                                              └─UP───┘                   └─270──┘
```

The **TRCREF** command specifies the relationship between a font and a table-reference character (TRC) in the data. When specified, the **TRCREF** command must immediately follow a **PAGEFORMAT** command.

```
PAGEFORMAT
  TRCREF
    SEGMENT
    OVERLAY
```

Depending on the value specified for *n*, the TRC is interpreted by the print server as being either S/370 1403 line-mode compatible or S/370 1403 line-mode incompatible: Notice that, if compatibility TRCs are to be used, no fonts should be specified in any **PRINTLINE** or **FIELD** commands within the same **PAGEFORMAT**.

0–3 Indicate a compatible TRC for a S/370 1403 line-mode data stream
4–126 Indicate a incompatible TRC for a S/370 1403 line-mode data stream

Also notice that any TRC number outside the range of 0-3 results in non-compatibility TRCs for the entire page definition. If compatibility TRCs are used, do not specify fonts on **PRINTLINE** or **FIELD** commands within the same **PAGEFORMAT**.

TRCREF *n* Specifies the TRC numbers that can appear in print data.

n The allowable values are 0 to 126; each **TRCREF** command must contain a unique number within a page format.

If *n* is omitted, PPFA automatically adds one to the *n* value of the previous **TRCREF** command in the sequence and assigns that value.

The default for the first **TRCREF** command is **0**.

Notes:

1. You may have multiple TRCs pointing to the same font.
2. If 4 or fewer fonts are specified, they are treated as compatibility TRCs and the left most 4 bits of the TRC are ignored. For example, in this case X'F0' and X'00' are both valid for TRC0.

Subcommands

FONT *name* Specifies the font that is associated with the TRC number.

name Specifies the local name of a font; the font must be one that has been named in a **FONT** command.

If you have used both the user-access name and the local name in the **FONT** command, use the local name here. If you have used only the user-access name, use it here.

DIRECTION Specifies the print direction of the line relative to the upper-left corner as you view the logical page. Not all printers can print in all print directions. For more information about your printer, refer to your printer documentation.

The **DIRECTION** on the **TRCREF** command must match the **DIRECTION** of the **PRINTLINE** command with which the TRC is to be used. If **TRCREF DIRECTION** subcommand is not specified, **DIRECTION ACROSS** is assumed. Observe that this direction is additive to the direction specified in the **PAGEFORMAT** command.

<u>**ACROSS**</u>	The page is printed with the characters added to the page from *left to right,* and the lines added from the top to the bottom.
DOWN	The page is printed with the characters added to the page from *top to bottom,* and the lines added from the right to the left.
BACK	The page is printed with the characters added to the page from *right to left,* and the lines added from the bottom to the top.
UP	The page is printed with the characters added to the page from *bottom to top,* and the lines added from the left to the right.

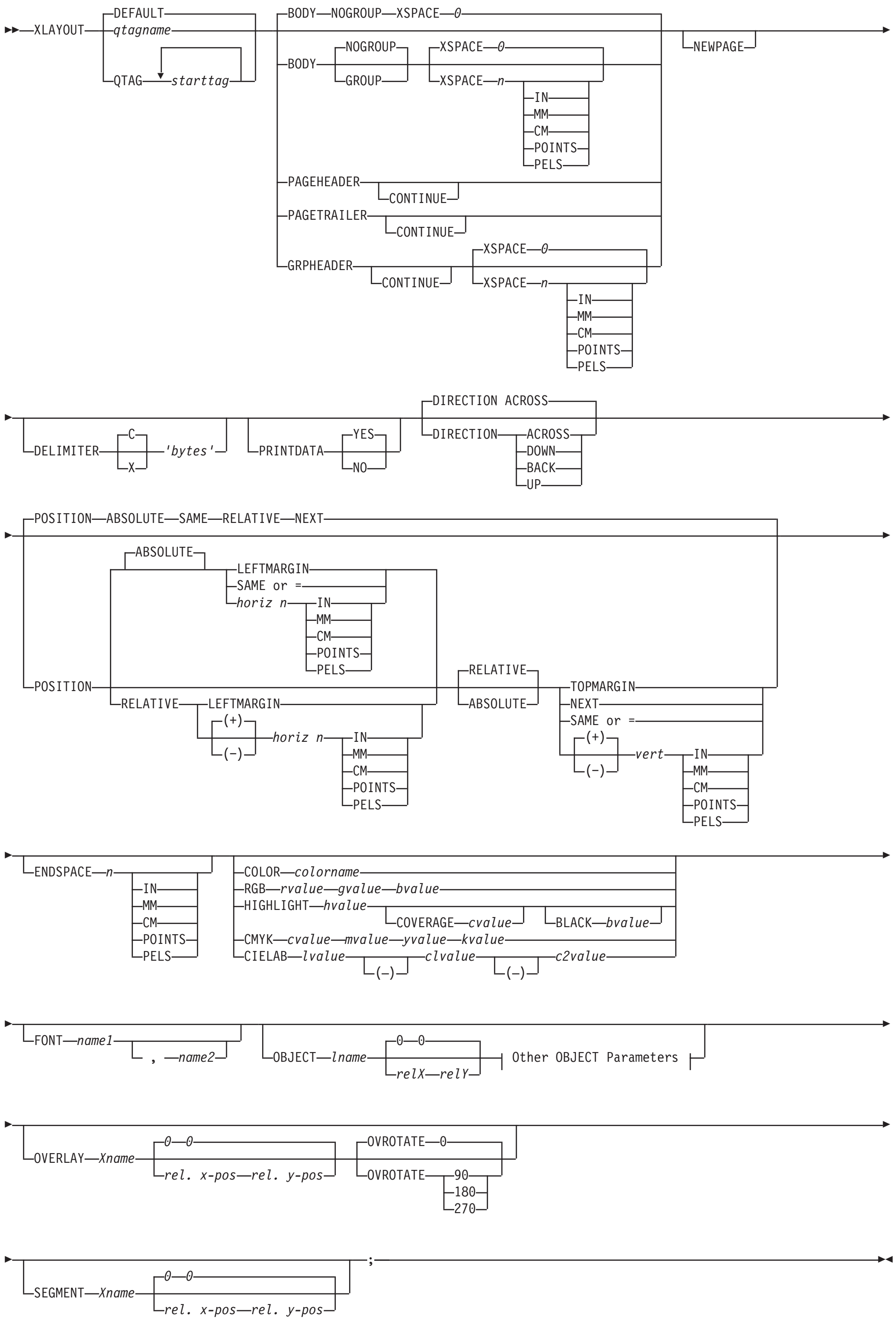
ROTATION Specifies the rotation of characters in degrees. The specified value is relative to the inline direction of the printline.

Valid rotations are 0°, 90°, 180°, or 270°; <u>**0**</u> is the default.

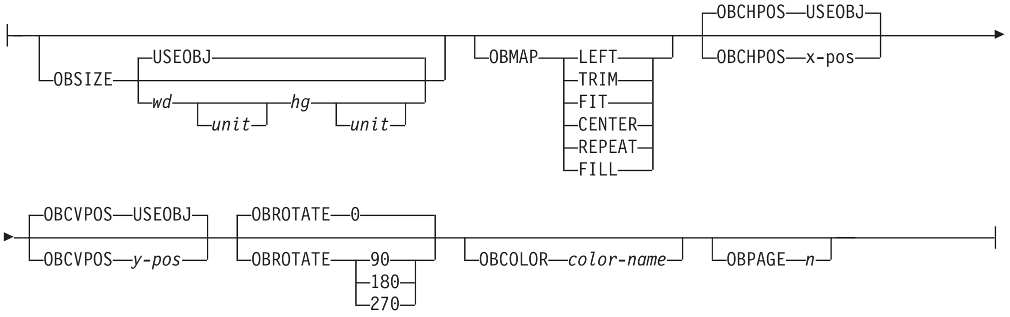
If the **TRCREF ROTATION** subcommand is not specified, the default is the rotation value specified on the **FONT** command.

XLAYOUT Command (XML)

XLAYOUT Command



Other OBJECT Parameters:



The **XLAYOUT** command addresses an XML data item by specifying a **QTAG** (qualified tag) for that data. A **QTAG** is a series of XML start tags that fully identify the XML data item.

Before printing the data, PSF scans the XML data item and matches it to an **XLAYOUT** command in the page definition by using its **QTAG**. The matching **XLAYOUT** command in the page definition is used to position and format the associated XML data item and its attributes on the printed page.

The XML page definition function has the following new PPFA concepts:

Relative Inline Positioning:

Relative inline positioning places data relative to the current position. If you position a text field and then place the text, the end of the text becomes the new current position. Graphics, barcodes, objects, segments, and overlays ***do not*** change the current position after they are originally positioned. For example, if you position a line with a **DRAWGRAPHIC LINE** command, the new current position is the starting point of that line. The length of the graphic line does not change the current position.

There are several restrictions when using relative inline positioning:

1. **XLAYOUT** commands with relative positioning cannot contain any of the following:
   - **FIELD** commands with inline positioning relative to the **XLAYOUT** (**LPOS**)
   - **FIELD ATTR** (attribute) with inline positioning relative to the **XLAYOUT** (**LPOS**)
   - **FIELD** commands with barcodes
   - **DRAWGRAPHIC** commands
   - **OBJECT** subcommands
   - **SEGMENT** subcommands
   - **OVERLAY** subcommands
2. You can only use the **SAME** parameter for inline positioning on the **XLAYOUT** command when the previously used **XLAYOUT** command used absolute inline positioning.

Absolute Inline Positioning:

Allows absolute inline positioning on a **FIELD** command for specific placement of elements.

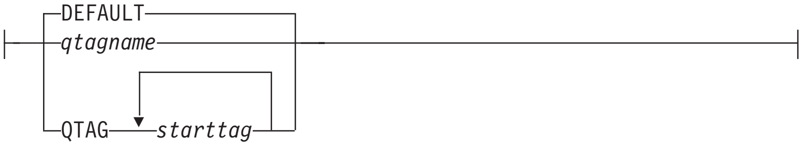
Attributes are Special FIELDs:

The attribute is identified by name and the data printed is from the attribute value or a portion of the attribute value and not from the element content.

Notes:

1. If a **FIELD** is used for presenting any piece of data on the **XLAYOUT** command, **FIELD** commands must be used for all pieces of data presented on the **XLAYOUT** command. Since an attribute is a special field, if you want to print both an attribute value and the element data you need to code the attribute field for the attribute value and a regular field for the element data.
2. PSF suppresses leading and trailing blanks (X'40' for EBCDIC or X'20' for ASCII) in the data. Multiple embedded blanks are reduced to one blank.
3. The **XLAYOUT** command defines an "XML" page definition and cannot be mixed with **PRINTLINE** commands which define "traditional" page definitions or **LAYOUT** commands which define "Record Formatting" page definitions.

Subcommands



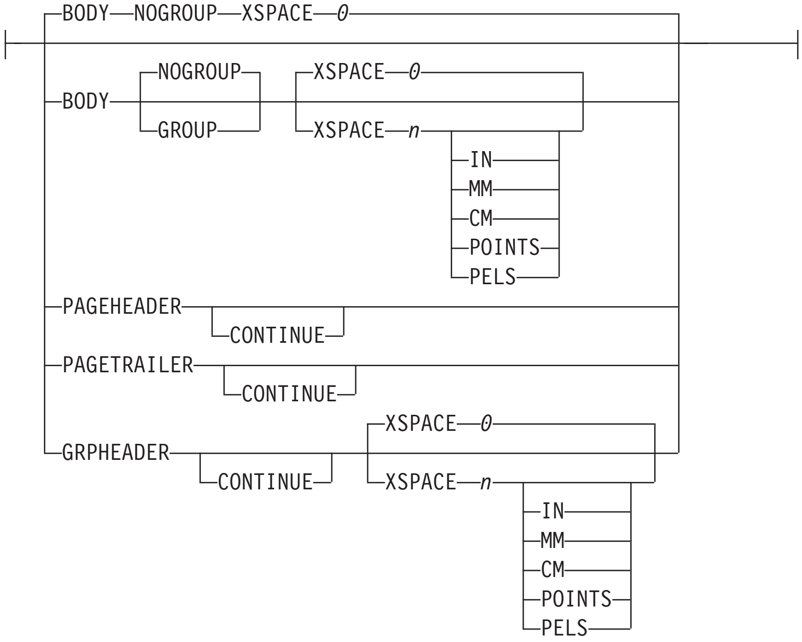
DEFAULT	This keyword is used only when the layout type is either **PAGEHEADER** or **PAGETRAILER**, and no name is needed. Only one default **PAGEHEADER** or **PAGETRAILER** can be specified in a **PAGEFORMAT**.
qtagname	The *qtagname* is a defined Qualified Tag. It is defined by the **DEFINE** *qtagname* **QTAG** command at the beginning of the page definition.
QTAG *starttag*	This is an explicit Qualified Tag. It is defined by coding a series of start tags separated by commas. A start tag is an XML data element name. Put the start tag in quotes if you want to preserve it's case. Otherwise it is folded to upper case.

```
<person>
  <name>
    <first>Justin</first>
    <last>Case</last>
  </name>
</person>


PAGEDEF  xxx...;
   DEFINE lname QTAG 'person','name', 'last';
   ...
   Pageformat x ...
      XLAYOUT lname POSITION...
      ...
   Pageformat y ...
      XLAYOUT QTAG 'person','name','last' POSITION ...
   ...
```

Figure 120. Example of XML data with the associated page definition

In Figure 120, "person", "name", and "first" are start tags. The qualifying tag for the data item "Case" is "'person','name','last'". In the example page definition both of the *x* and *y* **XLAYOUT** commands address the same XML data item “Case”.

BODY



The **BODY** layout type is used for the majority of data in your database. This is the default.

GROUP The **GROUP** parameter indicates that the existing group header should be saved and used for subsequent pages. If this parameter is not set when processing starts on a **BODY** layout, the active group header record is discarded and not reprinted on subsequent pages.

PAGEHEADER
This layout type specifies a header that is to be printed on each new page. The baseline position of this layout is normally in the top margin, but can be anywhere on a logical page. If **RELATIVE** is specified, the position is considered to be relative to the page origin. Usually contains customer's name, address, account number, and so forth. Only one default **PAGEHEADER** layout can be specified in a **PAGEFORMAT** and no input record data can be specified in a default layout.

CONTINUE The **CONTINUE** parameter indicates that this **XLAYOUT** command is a continuation of the Page Header definition. The formation of the Page Header may require the data from more than one data element. This is done by specifying the **CONTINUE** parameter.

GRPHEADER This layout type specifies a header that is to be printed at the beginning of a group of data. If a logical page eject occurs before the group of data ends, the header is printed after the top margin on each new page until the group ends. The baseline position of this layout can be specified as **RELATIVE**. It may include column headings.

CONTINUE The **CONTINUE** parameter indicates that this **XLAYOUT** command is a continuation of the Group Header definition. The formation of the Group Header may require the data from more than one data element. This is done by specifying the **CONTINUE** parameter.

XSPACE **XSPACE** indicates the amount of extra space from the position of the layout to the bottom of the group header area. This allows the user to identify the amount of eXtra space in excess of one text line being used by the header so that the baseline moves down and the following group data is not placed on top of the header area. This space is not calculated by PPFA and must be explicitly defined by the user. See example below (shaded space shows group header area):

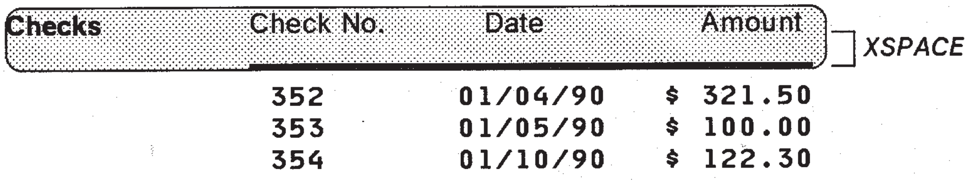


Figure 121. Example Showing the Use of ***XSPACE****.*

Once a Group Header record is processed and is still active when leaving the **PAGEFORMAT**, the group header record is saved by the presentation services program. Whenever the same **PAGEFORMAT** is re-invoked, this saved group header record is presented again if the first body record after re-invoking the **PAGEFORMAT** selects a Body record that has the Group Indicator on.

PAGETRAILER

This layout type specifies a trailer that is to be printed on each new page. The baseline position of this layout is normally in the bottom margin, but can be located anywhere on a logical page and can be specified as **RELATIVE**. Only one default **PAGETRAILER** layout can be specified in a **PAGEFORMAT** and no input record data is processed with a default layout. It may contain the name of the form or a footnote.

CONTINUE The **CONTINUE** parameter indicates that this **XLAYOUT** command is a continuation of the Page Trailer definition. The formation of the Page Trailer may require the data from more than one data element. This is done by specifying the **CONTINUE** parameter.

NEWPAGE

```
├──┬─────────┬──────────────────────────────────────────────┤
   └─NEWPAGE─┘
```

This parameter indicates that a new page should be started with this layout name. If this is a header or trailer layout, the print position is moved to the start of a new page before this header or trailer becomes the active header or trailer.

DELIMITER

```
├──┬──────────────────────────────────┬──────────────────────────┤
   │            ┌─C─┐                 │
   └─DELIMITER──┼───┼──'bytes'────────┘
                └─X─┘
```

The delimiter is a one or two byte code specified in either character or hex indicates a delimiting character within the customer's database and is used to separate fields. PPFA does not translate these characters. Hex characters must be entered in uppercase within the quotation marks.

PRINTDATA

```
├──┬────────────────────────┬──────────────────────────────────┤
   │            ┌─YES─┐     │
   └─PRINTDATA──┼─────┼─────┘
                └─NO──┘
```

Specifies whether the line of data associated with the current **LAYOUT** should be printed. The **PRINTDATA** subcommand is useful when the data stream is interspersed with lines of comments, blank lines, or lines without data that are not meant to be printed.

<u>YES</u> Specifies the data for the current **XLAYOUT** is printed. **<u>YES</u>** is the default.

NO Specifies the data for the current **XLAYOUT** is not printed.

DIRECTION

```
   ┌─DIRECTION ACROSS──────┐
├──┼───────────────────────┼──────────────────────────────────┤
   └─DIRECTION──┬─ACROSS─┬─┘
                ├─DOWN───┤
                ├─BACK───┤
                └─UP─────┘
```

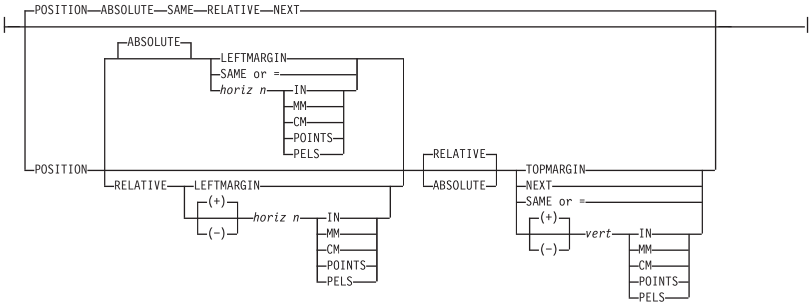
Specifies the print direction of the line relative to the upper-left corner as you view the logical page. Not all printers can print in all print directions. For more information about your printer, refer to your printer documentation.

If **DIRECTION** is not specified, the direction specified in the **PAGEFORMAT** command is used. Observe that this direction is additive to the direction specified in the **PAGEFORMAT** command. See “PAGEFORMAT Command” on page 456.

<u>ACROSS</u>	The layout direction is rotated 0 degrees relative to the direction specified in the **PAGEFORMAT** (the layouts are oriented in the same direction as the page).
DOWN	The layout direction is rotated 90 degrees relative to the direction specified in the **PAGEFORMAT**.
BACK	The layout direction is rotated 180 degrees relative to the direction specified in the **PAGEFORMAT**.

UP The layout direction is rotated 270 degrees relative to the direction specified in the **PAGEFORMAT**.

POSITION



This is for use in positioning **FIELD**, **DRAWGRAPHIC**, & **ENDGRAPHIC** text and graphics. If Relative is specified or **POSITION** is not specified, the baseline of the Position is relative to the previous **LAYOUT** position.

1. For **PAGEHEADER** RCD: The baseline position can be anywhere on a logical page, but cannot be specified as Relative.
2. For **PAGETRAILER**, **GROUPHEADER**, and **BODY** RCDs: The baseline position can be anywhere on a logical page and can be specified as **RELATIVE**.

Specifies the starting position of the layout in the printout.

RELATIVE

Specifies that the following horizontal position value is to be processed as a value relative to the current inline position.

horizontal position

x-pos Specifies the horizontal offset from the left side of the logical page. The value is a number with up to three decimal places. The valid options for *x-pos* are described in the **SETUNITS** command for the horizontal value.

LEFTMARGIN

Specifies this line starts at the position specified as the horizontal (*x*) value in the previous **LEFTMARGIN** subcommand within this page definition.

SAME Specifies this line starts at the same horizontal offset position as the previously coded **XLAYOUT**. If applied to the first **XLAYOUT** of a logical page, the horizontal position is 0, which is the default.

Note: This parameter is not valid with **RELATIVE** *horizontal*.

= Alternate for **SAME**.

RELATIVE

Specifies that the following vertical position value is to be processed as a relative value. The **XLAYOUT** is positioned relative to the last **XLAYOUT** placed on the page.

Note: If both TOP and RELATIVE are requested for the *y-pos* value, the **RELATIVE** request is ignored.

When using **RELATIVE** positioning, PPFA does not flag off-the-page conditions for the position of a **XLAYOUT** or for any overlays, segments or objects placed relative to that **XLAYOUT**. **XLAYOUT**s that fall outside the bounds of the logical page are flagged by the print server at run time.

When specifying **RELATIVE**, use the minus sign to indicate any negative values for the **XLAYOUT** vertical position; you may use the plus sign to indicate positive values. If no sign is used, a positive value is assumed.

The **DIRECTION** for a relative **XLAYOUT** must be **ACROSS**. Fields associated with a relative **XLAYOUT** must have the same **DIRECTION** as the **XLAYOUT** and must match the **PAGEFORMAT DIRECTION**.

If **RELATIVE** is specified with “**SAME**” or “=” as the “*y*” value, the relative value in the **XLAYOUT** is +0.

RELATIVE positioning is allowed on a **XLAYOUT** command only if the **XLAYOUT** and all its associated **FIELD** commands are formatted to print in the same direction as the **PAGEFORMAT**. That is, the **DIRECTION**N parameter in the **XLAYOUT** and any associated **FIELD** commands must specify (or default to) **ACROSS**. The **DIRECTION** in the **PAGEFORMAT** or **PAGEDEF** command may be any allowable value: **ACROSS**, **DOWN**, **BACK**, or **UP**.

vertical position

y-pos
Specifies the vertical offset from the top side of the logical page. The value options for *y-pos* are described in the **SETUNITS** command for the vertical value.

TOPMARGIN
Specifies that the **XLAYOUT** is placed in the position specified as the vertical (*y*) value in the **TOPMARGIN** subcommand within this page definition.

NEXT
Specifies the layout is to be positioned down (on the logical page) one line (as defined in the **LINESP** subcommand of the last **SETUNITS** command) from the previous field. The **LINESP** subcommand

of the **SETUNITS** command establishes the distance from one line to the next.

When **NEXT** is specified for the first **XLAYOUT** of a logical page, the starting position of the line is one line down from the top of the logical page, as defined by the **TOPMARGIN** subcommand.

Note: The “down” direction is determined by the direction of the logical page (as specified in the page format), not the **XLAYOUT** direction. **NEXT** is, therefore, mainly useful in **ACROSS XLAYOUT**s.

SAME Specifies this **XLAYOUT** starts at the same vertical position as the previous **XLAYOUT**.

= Alternate for **SAME**.

ENDSPACE

```
├──┬─────────────────────────┬──────────────────────────────────────────┤
   └─ENDSPACE─n─┬─────────┬──┘
                ├─IN──────┤
                ├─MM──────┤
                ├─CM──────┤
                ├─POINTS──┤
                └─PELS────┘
```

If the remaining body space is less than the value specified, **ENDSPACE** causes a logical page eject to be executed. This can be used, for example, on a **GRPHEADER** layout to ensure that a group header does not print at the end of a page without the first data record of the group. **ENDSPACE** does not include the space within the bottom margin (specified on the **PAGEDEF** or **PAGEFORMAT** command). This indicator is ignored on a **PAGEHEADER** or **PAGETRAILER** layout.

COLOR

```
├──┬─COLOR─colorname─────────────────────────────────────────────┬──────┤
   ├─RGB─rvalue─gvalue─bvalue────────────────────────────────────┤
   ├─HIGHLIGHT─hvalue─┬─────────────────┬──┬──────────────┬──────┤
   │                  └─COVERAGE─cvalue─┘  └─BLACK─bvalue─┘      │
   ├─CMYK─cvalue─mvalue─yvalue─kvalue────────────────────────────┤
   └─CIELAB─lvalue─┬───────┬─clvalue─┬───────┬─c2value───────────┘
                   └─(–)───┘         └─(–)───┘
```

Specifies an **OCA** or defined color for the text of this field. This subcommand is recognized only by printers that support multiple-color printing. Refer to your printer publication for information about the colors that can printed.

colorname Values for *colorname* can be a defined color (see “DEFINE COLOR Command” on page 313), or an OCA *colorname*. Values for OCA *colorname*s are:

NONE
DEFAULT

BLACK
BLUE
BROWN
GREEN
RED
PINK (or **MAGENTA**)
TURQ (or **CYAN**)
YELLOW
DARKBLUE (or **DBLUE**)
ORANGE
PURPLE
MUSTARD
GRAY
DARKGREEN (or **DGREEN**)
DARKTURQ (**DTURQ**, or **DCYAN**, or **DARKCYAN**)

The color choices depend on the printer.

If you do not enter one of these colors, the default color for that printer is used. **NONE** is the color of the medium. **DEFAULT** is the printer default color.

Note: In some printer manuals, the color turquoise (**TURQ**) is called “cyan”, and the color pink (**PINK**) is called “magenta”.

PPFA supports the following synonyms:
- **CYAN** for **TURQ**
- **DARKCYAN**N for **DARKTURQ**
- **DBLUE** for **DARKBLUE**
- **DCYAN** for **DARKTURQ**
- **DGREEN** for **DARKGREEN**
- **DTURQ** for **DARKTURQ**
- **MAGENTA** for **PINK**

Color Models

Specifies the color of print for this field supported in MO:DCA for the Red/Green/Blue color model (**RGB**), the highlight color space, the Cyan/Magenta/Yellow/Black color model (**CMYK**), and the **CIELAB** color model.

RGB *rvalue gvalue bvalue*

Three **RGB** integer values are used. The first (*rvalue*) represents a value for red, the second (*gvalue*) represents a value for green, and the third (*bvalue*) represents a value for blue. Each of the three integer values may be specified as a percentage from 0 to 100.

Note: An **RGB** specification of 0/0/0 is black. An **RGB** specification of 100/100/100 is white. Any other value is a color somewhere between black and white, depending on the output device.

HIGHLIGHT *hvalue* **COVERAGE** *cvalue* **BLACK** *bvalue*

Indicates the highlight color model. Highlight colors are device dependent.

You can use an integer within the range of 0 to 65535 for the *hvalue*.

Note: An *hvalue* of 0 indicates that there is no default value defined; therefore, the default color of the presentation device is used.

COVERAGE indicates the amount of coverage of the highlight color to be used. You can use an integer within the range of 0 to 100 for the *cvalue*. If less than 100 percent is specified, the remaining coverage is achieved with the color of the medium.

Note: Fractional values are ignored. If **COVERAGE** is not specified, a value of 100 is used as a default.

BLACK indicates the percentage of black to be added to the highlight color. You can use an integer within the range of 0 to 100 for the *bvalue*. The amount of black shading applied depends on the **COVERAGE** percentage, which is applied first. If less than 100 percent is specified, the remaining coverage is achieved with black.

Note: If **BLACK** is not specified, a value of 0 is used as a default.

CMYK *cvalue mvalue yvalue kvalue*

Defines the cyan/magenta/yellow/black color model. *Cvalue* specifies the cyan value. *Mvalue* specifies the magenta value. *Yvalue* specifies the yellow value. *Kvalue* specifies the black value. You can use an integer percentage within the range of 0 to 100 for any of the **CMYK** values.

CIELAB *Lvalue* **(–)***c1value* **(–)***c2value*

Defines the **CIELAB** model. Use a range of 0.00 to 100.00 with *Lvalue* to specify the luminance value. Use signed integers from −127 to 127 with *c1value* and *c2value* to specify the chrominance differences.

Lvalue, *c1value*, *c2value* must be specified in this order. There are no defaults for the subvalues.

Note: Do not specify both an **OCA** color with the **COLOR** sub-parameter and an extended color model on the same **FIELD** or **PRINTLINE** command. The output is device dependent and may not be what you expect.

Do not specify two extended **COLOR** subcommands on the same **FIELD** or **PRINTLINE** command.

FONT

```
├──┬──────────────────────────────┬──────────────────────────┤
   └─FONT──name1──┬────────────┬──┘
                  └─ , ──name2─┘
```

Defines the font to be used for the layout.

name1
Specifies the name of a font used to print the data. This font must have been defined in a previous **FONT** command in this page definition.

If Shift-Out, Shift-In (SOSI) processing is used, *name1* must be the single-byte font.

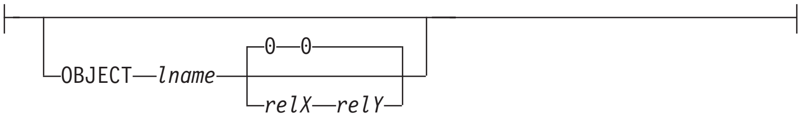
name2
Specify only when using Shift-Out, Shift-In (SOSI) processing to dynamically switch between a

single-byte font and a double-byte font within the layout. *name2* must be the double-byte font.

Notes:

1. If this subcommand is not specified in the print data, the print server uses the font indicated. Otherwise, the print server selects a default font.
2. *name2* is only valid with EBCDIC data.

OBJECT *parameters*



Specifies the local name of an object that is to be positioned and oriented relative to the location specified in the **XLAYOUT** command in which the **OBJECT** subcommand was named. The **OBJECT**, as identified by the *lname* parameter, must have been defined by an **OBJECT** command.

Note: Multiple page/image objects used without specifying a page using **OBPAGE** will default to using the first page in the object.

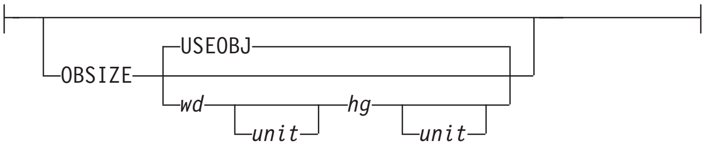
You may place multiple objects on the same **XLAYOUT** command and you may place the same object multiple times. Each placement must have its own set of placement parameters, as follows:

lname
Specifies the local name of an object that is up to 16 alphanumeric characters in length. The *lname* parameter is used to match the **XLAYOUT OBJECT** subcommand to its definition from the **OBJECT** command. An object must be defined with this internal name by the **OBJECT** command.

relative-xpos relative-ypos
Specifies the number of units (inches, mm, and so on) that are added to the position of the current **XLAYOUT** to position the top-left corner of the object. The values for the horizontal and vertical positioning are limited by the type of printer used and the L-units specified with the **PELSPERINCH** parameter on the **PAGEDEF** or **PAGEFORMAT** command.

Each position specification can be a positive or negative number with up to three decimal places. The units specified can be one of the following: **IN**, **MM**, **CM**, **POINTS**, or **PELS**.

OBSIZE



Specifies the size of the object placement area. When no

OBSIZE is specified, the default is the size specified in the object. If no size is specified in the object, the size of the page is used. The page width is as specified on the **PAGEDEF** or **PAGEFORMAT** commands, or it defaults to 8.3 inches by 10.8 inches.

wd	Specifies the width of an object placement area as a number with up to three decimal places. The allowable width may vary with the type of printer used and the L-units specified with the **PELSPERINCH** parameter on the **PAGEDEF** or **PAGEFORMAT** command.
hg	Specifies the height of the object placement area as a number with up to three decimal places. The allowable height may vary with the type of printer used and the L-units specified with the **PELSPERINCH** parameter on the **PAGEDEF** or **PAGEFORMAT** command.
unit	Specifies a unit of measurement for the width parameter. The choices are: **IN**, **MM**, **CM**, **POINTS**, or **PELS**. **Note:** If no unit is specified, the default is the most recent **SETUNITS** command value or **IN** (inch) if a **SETUNITS** command has not been issued.
USEOBJ	Specifies that the size measurements specified in the object are to be used. If no size is specified in the object, the size of the page is used, which is the length and width as specified on the **PAGEDEF** or **PAGEFORMAT** commands, or it defaults to 8.3 inches by 10.8 inches.

OBMAP

```
├──┬──────────────────────┬──────────────────────────────────────────┤
   └─OBMAP───┬─LEFT───┬──┘
             ├─TRIM───┤
             ├─FIT────┤
             ├─CENTER─┤
             ├─REPEAT─┤
             └─FILL───┘
```

Specifies mapping options. The **OBMAP** parameter defines the mapping of the object to the object placement area. If **OBMAP** is not coded, the mapping option within the object is used. If the object does not contain a mapping option, then the print server sets it to the created default for the container type.
Each object type (**OBTYPE** on the **OBJECT** command) dictates the allowable mapping options for that type. When it can, PPFA issues a message when these rules are violated. However, in the case of an object type of page

segment (**OBTYPE=PSEG**), PPFA does not know what types of objects are contained in it; therefore, PPFA cannot enforce the restrictions. See “OBJECT Command” on page 423 for a description of the restrictions.

LEFT	Specifies that the object is positioned at the upper, left-hand corner of the object placement area, as defined or defaulted by the *relative-xpos*, *relative-ypos*, **OBCHPOS**, and **OBCVPOS** parameters. Any portion of the object that falls outside the object placement area as defined by the **OBSIZE** parameter is not trimmed and could cause an exception condition by the presentation system.
TRIM	Specifies position and trim. The object is positioned at the upper, left-hand corner of the object placement area, as defined or defaulted by the *relative-xpos*, *relative-ypos*, **OBCHPOS**, and **OBCVPOS** parameters. Any portion of the object that falls outside the object placement area as defined by the **OBSIZE** parameter is trimmed.
FIT	Specifies scale to fit; this is the default value if the **OBMAP** parameter is not coded. The object is to be scaled to fit within the object placement area, as defined by the **OBSIZE** parameter. The center of the object is placed in the center of the object placement area and the object is scaled up or down to fit the block. Scaling in the horizontal and vertical directions is symmetrical. The **FIT** parameter ensures that all of the data in the object is presented in the object placement area at the largest possible size. The object is not trimmed.
CENTER	Specifies that the center of the object be positioned at the center of the object placement area. Any portion of the object that falls outside the object placement area is trimmed.
REPEAT	Specifies that the origin of the data object be positioned with the origin of the object placement area. The object is then replicated in the X and Y directions. If the last replicated data does not fit in the object area, it is trimmed to fit.
FILL	Specifies that the center of the data object be positioned coincident with the center of the object placement area. The data object is then scaled, so that it totally fills the object placement area in both the X and Y directions. This may require that the object

be asymmetrically scaled by different scale factors in the X and Y directions.

OBCHPOS

```
   ┌─OBCHPOS──USEOBJ─┐
├──┤                 ├──────────────────────────────┤
   └─OBCHPOS──x-pos──┘
```

Specifies the horizontal offset of the object contents within the object placement area as a number.

x-pos	Specifies a positive or negative number. The valid options for *x-pos* are described in the **SETUNITS** command for the horizontal value.
USEOBJ	Specifies that the offset value from the object is to be used. If no value is set in the object, the value defaults to **0**.

OBCVPOS

```
   ┌─OBCVPOS──USEOBJ─┐
├──┤                 ├──────────────────────────────┤
   └─OBCVPOS──y-pos──┘
```

Specifies the vertical offset of the object contents within the object placement area, as defined by the **OBSIZE** parameter. If **OBCVPOS** is not specified, it defaults to **USEOBJ** and uses the value set in the object. If no value is set in the object, the value defaults to **0**. The **OBCHPOS** parameter is used only in **LEFT** and **TRIM** mapping of the object into the object placement area.

y-pos	Specifies a positive or negative number. The valid options for *y-pos* are described in the **SETUNITS** command for the vertical value.
USEOBJ	Specifies that the offset value from the object is to be used. If no value is set in the object, the value defaults to **0**.

OBROTATE {0|90|180|270}

```
   ┌─OBROTATE──0──────┐
├──┤                  ├─────────────────────────────┤
   └─OBROTATE──┬─90──┬┘
               ├─180─┤
               └─270─┘
```

Specifies the object rotation with respect to the current LND's coordinate system.

OBCOLOR *colorname*

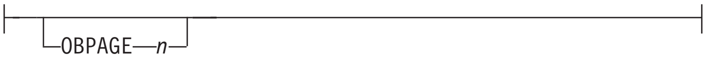
```
├──┬──────────────────────┬──────────────────────────┤
   └─OBCOLOR──color-name──┘
```

Specifies the color to be used as the default color or initial color for the object placement area. The **OBCOLOR** parameter is used only for objects of the **PSEG**, **GOCA**, **BCOCA**, and **IOCA** type. If the object type is **OTHER**, this parameter is ignored.

colorname Values for *colorname* can be a defined color (see “DEFINE COLOR Command” on page 313) or one of the **OCA** color spaces listed below.

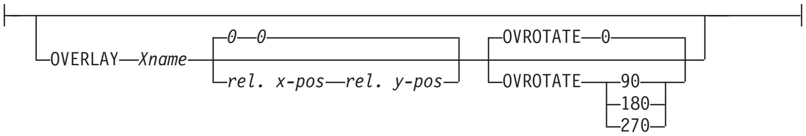
NONE
DEFAULT
BLACK
BLUE
BROWN
GREEN
RED
PINK (or **MAGENTA**)
TURQ (or CYAN)
YELLOW
DARKBLUE (or **DBLUE**)
ORANGE
PURPLE
MUSTARD
GRAY
DARKGREEN (or **DGREEN**)
DARKTURQ (**DTURQ**, or **DCYAN**, or **DARKCYAN**)

OBPAGE



Specifies the page number of a multipage object or file to be presented. ***n*** is the page number. A number from 1 to 999999999 (9 digits) is valid.

OVERLAY



Specifies the name of an overlay that is to be positioned relative to the location specified in the **XLAYOUT** command in which the **OVERLAY** subcommand was named. The **PAGEFORMAT OVERLAY** command may contain the named overlays. The maximum number of overlays specified for a **PAGEFORMAT** including the **XLAYOUT OVERLAY** subcommand is 254. Specifies the electronic overlay that is to be used with this subgroup.

name Specifies the user-access name as defined in the **OVERLAY** command.

Notes:

1. PPFA checks for duplication of local names. If there is a duplication, the page definition is generated, but a warning message is issued.

2. PPFA does not check for duplicate user-access names.

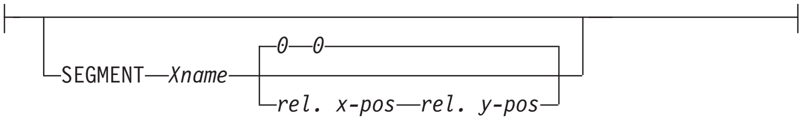
relative-xpos relative-ypos
Specifies the number of units (inches, mm, and so on) that are added to the position of the layout to position the top-left corner of the overlay. The values for horizontal and vertical may be (+) or (–). The maximum value is + or – 32760 L-units. For example:
- OVERLAY NAME1 2 in 1 in
- OVERLAY NAME2 5 mm 1 mm

Note: Any offset coded in the overlay itself is added to this offset.

OVROTATE {0|90|180|270}
Specifies the rotation of the placed overlay with respect to the x-axis of the page.

See "FORMDEF Command" on page 257 for an **OVROTATE** example, which is presented in the **FORMDEF** description.

SEGMENT



Specifies the name of a segment that is to be positioned relative to the location specified in the **XLAYOUT** command in which the **SEGMENT** subcommand was named. The **PAGEFORMAT SEGMENT** command may contain the named segments. The maximum number of segments specified for a **PAGEFORMAT** including the **XLAYOUT SEGMENT** subcommand is 127. Specifies the page segment that is to be used with this subgroup.

name Specifies the user-access name as defined in the **SEGMENT** command.

Notes:

1. PPFA checks for duplication of local names. If there is a duplication, the page definition is generated, but a warning message is issued.
2. PPFA does not check for duplicate user-access names.

relative-xpos relative-ypos
Specifies the number of units (inches, mm, and so on) that are added to the position of the layout to position the top-left corner of the page segment. The values for horizontal and vertical may be (+) or (–). The maximum value is + or – 32760 L-units. For example:
- SEGMENT MYSEG1 2 in 1 in
- SEGMENT MYSEG1 5 mm 1 mm

Example of printing XML data with a page definition

DATA:

```
<customer type='Home'>
   <name>
     <first>Justin</first>
     <last>Case</last>
   </name>
   <address>
      <strno>123</strno>
      <street>Redlight Lane</street>
      <city>Twistnshout</city>
      <state>MAMassachusetts</state>
      <zip>01050</zip>
   </address>
</customer>

<customer type='Work'>
   <name>
     <first>Anna</first>
     <last>Merkin</last>
   </name>
   <address>
      <strno>1911</strno>
      <street>Colt Lane</street>
      <city>Longmont</city>
      <state>COColorado</state>
      <zip>80501</zip>
   </address>
</customer>
```

Figure 122. Example of printing XML data with a page definition (part 1)

RESULTS: Using the following page definition and the XML data in Figure 122 I want to print:

```
Home customer: Justin Case           123 Redlight Lane
                                     Twistnshout, MA 01050

Work customer: Anna Merkin           1911 Colt Lane
                                     Longmont, CO 80501
```

Figure 123. Example of printing XML data with a page definition (part 2)

PAGE DEFINITION:

```
SETUNITS 1 IN 1 IN LINESP 6 LPI;
Pagedef XMLxml replace yes UDType EBCDIC;
 FONT   E21H0C TYPE EBCDIC;
 DEFINE cust    QTAG 'customer';
 DEFINE name    QTAG 'customer','name';
 DEFINE fname   QTAG 'customer','name','first';
 DEFINE lname   QTAG 'customer','name','last';
 DEFINE addr    QTAG 'customer','address';
 DEFINE strno   QTAG 'customer','address','strno';
 DEFINE street  QTAG 'customer','address','street';
 DEFINE city    QTAG 'customer','address','city';
 DEFINE state   QTAG 'customer','address','state';
 DEFINE zip     QTAG 'customer','address','zip';

 XLAYOUT cust   POSITION ABSOLUTE 0
   FIELD ATTR 'type' ;
   FIELD TEXT ' customer:' ;
 XLAYOUT fname  POSITION ABSOLUTE 2.5      SAME;
 XLAYOUT lname  POSITION RELATIVE 0.167    SAME;
 XLAYOUT strno  POSITION ABSOLUTE 5.5      SAME;
 XLAYOUT street POSITION RELATIVE 0        SAME;
   FIELD TEXT ' '        ;
   FIELD START  1 LENGTH *;
 XLAYOUT city   POSITION ABSOLUTE 5.5      NEXT;
   FIELD START  1 LENGTH *;
   FIELD TEXT ', ';
 XLAYOUT state  POSITION RELATIVE 0        SAME;
   FIELD START  1 LENGTH 2;
   FIELD TEXT   ' ';
 XLAYOUT zip    POSITION RELATIVE 0        SAME;
```

Figure 124. Example of printing XML data with a page definition (part 3)

Part 4. Appendixes

Appendix A. System Dependencies for PPFA

PPFA is a cross system product that operates on:
- VSE (Virtual Storage Extended)
- OS/390 & z/OS (Operating System 390)
- VM (Virtual Machine)
- AIX (Advanced Interactive Executive)

For the level of the operating system on which PPFA can run, refer to the *Licensed Program Specification*.

PPFA creates page definitions and form definitions used for printing by PSF for OS/390 and z/OS, and PSF/VM. Page definitions and form definitions created on one system can be used for printing on another system. However, not all versions of print servers support all functions provided by PPFA. Use the Programming Guide or User's Guide for your print server system to determine which functions are supported by your system.

While page definitions and form definitions created on one system can be used on any of the systems, the method of creating these resources is different.

Each system is presented to show how PPFA creates page definitions and form definitions. In the examples, the prefixes F1 and P1 are automatically added by PPFA to the user name designated for form definitions and page definitions.

VSE Environment

PPFA can operate in any partition of VSE. It operates in batch mode but is able to operate in a partition occupied by an interactive processor.

Storing PPFA Resources

Form definitions and page definitions are stored by name in a library. In VSE, sub-libraries are created for form-definition and page-definition storage within the system library.

The following job control statements (JCS) give an example of a PPFA execution under VSE. The 'C' in Column 72 indicates a continuation.

```
                                                       72 Column
* $$ JOB                                                   │
// CLASS=0                                                 │
// JOB    PPFAEXEC                                         ↓
// ASSGN  SYSLST,00E                                       C
// OPTION DUMP
// LIBDEF PHASE,SEARCH=(ppfa.program),TEMP
// EXEC   PGM=AKQPPFA,SIZE=AUTO,
          PARM='FORMLIB=ppfa.formdef,PAGELIB=ppfa.pagedef,C
               size=128K'

   PPFA control statements )
                             )
                             >    SYSIPT file
                             )
/*
/&
* $$ EOJ
```

Rules for VSE

The rules for VSE commands in a PPFA execution follow:

- All characters in the EXEC statement parameters must be uppercase. Each keyword in a parameter must be unique; PPFA issues an error message if any keywords are duplicated.
- AKQPPFA is the program name.
- SIZE= is the maximum available storage in the program. The SIZE parameter is not used to specify a PPFA work area size.
- PARM= is used to input PPFA parameters.
  - FORMLIB= (or PAGELIB=) libraryname.sublibraryname
    - All library names are alphanumeric (1 to 7 characters); the first character must be alphabetic.
    - All sublibrary names are alphanumeric (1 to 8 characters) including the first character.
  - size=*nn*K or *nnn*M
    - Defines the work area in which PPFA compiles the page definitions and form definitions. The default is 128k, the minimum is 4K, the maximum is 16M.
- The format for the FORMLIB or PAGELIB parameters is:
  - FORMLIB= (or PAGELIB=) libraryname.sublibraryname, where library names are 1 to 7 characters long and sublibrary names are 1 to 8 characters long.
  - All characters (library and sublibrary names) are alphanumeric, except that the first character must be alphabetic.
- Libraries must be defined prior to PPFA execution; Otherwise, an ABEND occurs. PPFA can perform a syntax check without libraries being defined, but it cannot define its own libraries;
- The SYSIPT file drives PPFA. It contains the commands used to build form definitions and page definitions. The records are fixed-length records of either 80 or 81 bytes, which can be blocked. The last 8 bytes of the records are treated as comments.

OS/390 and z/OS Environment

The following example shows you how to create page definitions and form definitions in the OS/390 and z/OS environment.

Form definitions and page definitions are stored by name in a library.

PPFA for OS/390 and z/OS is run as a batch program with Job Control Language (JCL). The JCL statements are an example of PPFA execution under OS/390 and z/OS:

```
//JOBPPFA     JOB TOKYO
//STEP        EXEC PGM=AKQPPFA
//STEPLIB     DD DSN=ppfa.program,DISP=SHR
//SYSPRINT    DD SYSOUT=A
//FORMLIB     DD DSN=ppfa.formlib,DISP=SHR
//PAGELIB     DD DSN=ppfa.pagelib,DISP=SHR
//SYSIN       DD *

   PPFA control statements
   .
   .
   .
/*
```

The SYSIN file contains the commands used to build form definitions and page definitions. The records can be fixed length or variable length, and they can be blocked. The maximum length for fixed-length records is 100 bytes; the maximum length for variable-length records is 104 bytes. In the case of fixed 80-byte records, the last 8 bytes are treated as comments.

The record format for the page-definition and form-definition data sets must be variable blocked (VBM). The block size and record length must be 8209 and 8205. PPFA uses all of the available storage in the program.

Note: When concatenating multiple data sets in the SYSIN data definition, you must ensure that the data set with the largest block size is first in the concatenation order. Otherwise, the output may not be what you expect.

VM Environment

To create a page definition and form definition running PPFA under VM, use the following command syntax:

Note: The defaults require only filename (*fn*) and filetype (*ft*) for your PPFA source file.

```
PPFA fn ft [ fm ] [ ( [PAGEDEF ( ft [ fm | A1 ] )
                      [FORMDEF ( ft [ fm | A1 ] )
                      [LISTING ( ft [ fm | A1 ] )
                      [SIZE   nnnn{K|M} ] ) ]
```

PPFA is the command to run PPFA on VM. The filename (*fn*) is the name of your file that contains the PPFA control statements. The filename (*fn*) and filetype (*ft*) are required parameters. When you specify only the *fn* and *ft*, the filemode goes to your default disk.

The record format of the PPFA input source file is either V or F. The variable record length is a maximum of 100 bytes. In the case of a fixed 80-byte record, the last 8 bytes are treated as comments.

The PPFA command may include any of four optional parameters: PAGEDEF, FORMDEF, LISTING, and SIZE.

- Each keyword parameter can be abbreviated as two letters.
- All parameters in the command can be omitted. However, any optional parameter following an open parenthesis must be specified.
- Operands must be enclosed in parentheses when more than one operand is specified for one parameter. Parentheses can be omitted when only one operand is specified for one parameter. Also, the final closing parenthesis can be omitted.
- Any operand string longer than eight characters is truncated to the first eight characters.
- Any parameter or operand can be separated from others by parentheses or blanks. The only exceptions are the K and the M operands of a size parameter. For example, in size 256K you cannot separate the 256 from the K.
- The same parameter must not be specified more than once in a command. If duplicate parameters or operands appear, PPFA issues an error message and terminates the program.
- For errors associated with a VM execution command, PPFA issues an error message with a return code 20, and does not generate any files (object or listing).

- No optional parameters can follow the open parenthesis occurring after the input source file ID.
- The size parameter varies according to the size of the command stream. Most command streams do not need a size value because the default specifies enough space for processing. The minimum size is 4K and the maximum size is 16M.

PAGEDEF Parameter

PAGEDEF (which can be abbreviated as PA) is the keyword used to specify the name of a page-definition resource. (The filetype is required; the filemode is optional. If you do not specify a filemode, A1 is assumed.) The page-definition filename is obtained from your input file, and P1 is prefixed to that name.

As an example, for the command

```
PPFA PCOM DATA A1 ( PAGEDEF ( PAGEOBJ B1 ) )
```

the input file, PCOM DATA A1, contains the following control statements:

```
PAGEDEF PAGE1;
  PRINTLINE;
FORMDEF FORM1;
```

The result is a page-definition resource file with the filename P1PAGE1, the filetype PAGEOBJ, and the filemode B1.

If the page definition parameter is not used, a page-definition resource with the default name P1 (the page definition name from input file) PDEF38PP A1 is created.

The record format of the object file is VM and VA (5A records). 5A records contain the character X'5A' in the first byte of each record. The record size is up to 8205 bytes.

FORMDEF Parameter

FORMDEF (which can be abbreviated as FO) is the keyword used to specify the name of a form-definition resource. (The filetype is required; the filemode is optional.) The filename is obtained from your input file, and F1 is prefixed to that name. As an example, for the command

```
PPFA PCOM DATA A1 ( FORMDEF ( FORMOBJ B1 ) )
```

the input file, PCOM DATA A1, contains the following control statements:

```
PAGEDEF PAGE1;
  PRINTLINE;
FORMDEF FORM1;
```

The result is a form-definition resource file with the filename F1FORM1, the filetype FORMOBJ, and the filemode B1.

If the form-definition parameter is not used, a form-definition resource with the default name F1 (form-definition name from input file) FDEF38PP A1 is created.

The record format of the object file is VM and VA (5A records). The record size is up to 8205 bytes.

LISTING Parameter

LISTING (which can be abbreviated as LI) is the keyword used to specify the name of an output listing file. You can specify the filetype and filemode of the resource; the filetype is required. If you do not specify a filemode, A1 is assumed. The filename is the same as the PPFA input filename.

As an example, for the command

```
PPFA PCOM DATA A1 ( LISTING ( LISTOUT B1 )
```

the result is an output listing file with the name PCOM LISTOUT B1.

If the LISTING parameter is not used, an output listing file with the default name (PPFA input filename) LISTING A1 is created.

The record format of an output listing file is VA. The record length is 121 bytes (120 bytes + 1 byte (channel control number)). CC numbers are 0 to 12 in the first column of the line data file.

RUN and OPTIONS file

This is an example of the VM files that print your data file with the form definition and page definition that you specify.

VM EXEC Example

```
**************************************************************************
/*THE ENVIRONMENT IS NOW SET UP TO PRINT */
'CP SP PRT TO NET NOHOLD CLASS A FORM PRT035 COPY 1';
'CP TAG DEV PRT WASVM SYSTEM';
'PSF EXAMP1 PRTDATA A1 ( OPTIONS (EXAMP1) )';
/*RESTORE THE ENVIRONMENT TO PRINT SOMETHING OTHER THAN THIS EXAMP
**************************************************************************
```

VM OPTIONS Example

```
*******************************************************************
FORMDEF  (  F1EXAMP1    FDEF38PP      ) SEND
*******************************************************************
PAGEDEF  (  P1EXAMP1      PDEF38PP      ) SYSDISK
*******************************************************************
OVERLAY  (  *              OVLY38PP      ) SYSDISK
*******************************************************************
*  COMMON  OPTIONS
*******************************************************************
CC
NOTRC
BIN  1
CKPTPAGE  0
DATACK  UNBLOCK
NODUMP
FILE  SEND
FONT       (  *  FONT3820    ) SYSDISK
MESSAGES  NO
NOOPT
PAGESEG  (  *  PSEG38PP    ) SYSDISK
TRACE  OFF
*******************************************************************
```

Appendix B. More about Direction

In PPFA, directions specified with the **PRINTLINE** and **TRCREF** commands are relative to the direction specified in the **PAGEFORMAT** command. If no **PAGEFORMAT** command has been specified, the direction specified in the **PAGEDEF** command is used. If no direction has been specified in either of these commands, the default direction for the page format is **ACROSS**.

The **PRINTLINE** and **TRCREF** commands *add* their **DIRECTION** values to the **DIRECTION** value specified with the **PAGEFORMAT** command. Thus, you may select a **PAGEFORMAT** direction and code **PRINTLINE**s and **TRCREF**s relative to the **PAGEFORMAT** direction. For more information about the **PRINTLINE** and **TRCREF** commands, see Chapter 3, "Using Page Definition Commands for Traditional Line Data," on page 35.

For instance, if a page is to be printed in the landscape page presentation on a printer that requires the **DOWN** or **UP** print direction to generate landscape output, the **PAGEFORMAT** command can specify **DOWN** as its **DIRECTION**. Once this direction is established, you can view the page as a landscape page and specify the **PRINTLINE** and the **TRCREF** commands with the **ACROSS** direction. Output specified in this way prints **ACROSS** relative to the landscape page, as shown in Figure 125.

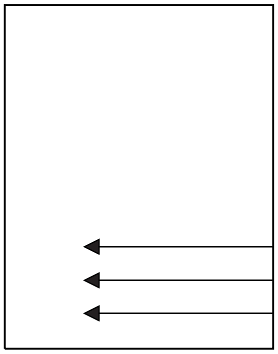


Figure 125. Printing Across a Landscape Page

Note that if you specify the **DOWN** direction for the **PRINTLINE** or the **TRCREF** command in this case, the output looks like Figure 126 on page 520 because the direction of the page format is also **DOWN**.

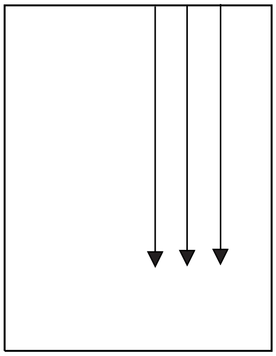


Figure 126. Printing Down a Portrait Page

Table 20 shows the final result when all of the possible combinations of **DIRECTION** are specified. The final direction that PPFA computes from the **PAGEFORMAT**, **PRINTLINE**, and **TRCREF** commands determines the prefix assigned to the font names specified in the page definition. The final direction is particularly important when printing on the 3800 printer because its unbounded-box font architecture requires a separate font for each combination of print direction and character rotation. This information is encoded in the prefix of the font name (X1, X3, XA, and XF, for example).

Table 20. The Effect of Additive DIRECTIONs on Formatting and Font Prefixes

Page Format	**PRINTLINE or TRCREF**	**Final Result**	**3800 Font Prefix**			
			0°	90°	180°	270°
Across	Across	Across	X1	X5	X9	XD
Across	Down	Down	X2	X6	XA	XE
Across	Back	Back	X3	X7	XB	XF
Across	Up	Up	X4	X8	XC	XG
Down	Across	Down	X2	X6	XA	XE
Down	Down	Back	X3	X7	XB	XF
Down	Back	Up	X4	X8	XC	XG
Down	Up	Across	X1	X5	X9	XD
Back	Across	Back	X3	X7	XB	XF
Back	Down	Up	X4	X8	XC	XG
Back	Back	Across	X1	X5	X9	XD
Back	Up	Down	X2	X6	XA	XE
Up	Across	Up	X4	X8	XC	XG
Up	Down	Across	X1	X5	X9	XD
Up	Back	Down	X2	X6	XA	XE
Up	Up	Back	X3	X7	XB	XF

The entries in the **Final Result** column can be computed using a simple algorithm. If you assume that **ACROSS** is 0, **DOWN** is 1, **BACK** is 2, and **UP** is 3, you can add the direction specifications in the two commands, subtracting 4 when the result is 4 or greater, to compute the final direction.

Appendix C. Differences in Measurements and REPEATs with AFP Utilities

When repeating a **DRAWRULE** (OGL), **PRINTLINE** (PPFA), **DRAWGRAPHIC** (PPFA), or “Line” (PMF), there are differences in the measurements of the repeated lines. For OGL, **REPEAT** indicates the number of repetitions *in addition to* the first. For **DRAWGRAPHIC** (PPFA), **REPEAT**T is the same as OGL. Therefore, **REPEAT** yields 2 **DRAWRULE**s. For PPFA, **REPEAT** indicates the total number of **PRINTLINE**s. Therefore, **REPEAT** yields 2 **PRINTLINE**s.

Another difference occurs when the line spacing (set by **SETUNITS** in OGL and PPFA, and by a screen item in PMF) results in the distance from one line to the next not being a whole number of pels. Each product handles the fractional pel differently. Because the printer cannot print parts of a pel, fractional pels cannot be represented at the printer. When line spacing calculations result in a fractional pel per line space, the following occurs:

OGL Carries the fractions until they add up to a whole pel, then adds it in. This results in the final spot of a repeat being within a pel of where it is expected. Therefore, not all of the spaces between rules are even; they can vary by one pel.

PPFA Truncates the fractional pel prior to the repeat. Therefore, the spaces between the lines are even, but the total might be shorter than expected.

PMF Rounds the fractional pel prior to the repeat. Therefore, the spaces between the lines are even, but the total might be shorter or longer than expected. If the fractional pel is less than 0.5, it is handled the same as PPFA and the line space is shorter. If the fractional pel is greater than or equal to 0.5, the line space is longer.

Use line spacing in all products that result in a whole number of pels. To resolve existing problems, select the resource that you don't want to change, and code the remaining resource without using **REPEAT** because of the way the other products handle the fractional pels.

For example, if you want to print at 9 lines per inch, and repeat this for 20 lines, the following occurs. Starting at zero, and adding 9 lines per inch (converted to pels this is 240/9 = 26.6670), you see the results illustrated in Table 21 on page 522.

Table 21. Differences in Measurements and REPEATs with AFP Utilities

	Mathematics		OGL		PPFA		PMF	
Repetition	**Position**	**FromLast**	**Position**	**FromLast**	**Position**	**FromLast**	**Position**	**FromLast**
	0.000	-.---	0	---	0	---	0	---
1	26.667	26.667	26	26	26	26	27	27
2	53.333	26.667	53	27	52	26	54	27
3	80.000	26.667	80	27	78	26	81	27
4	106.667	26.667	106	26	104	26	108	27
5	133.333	26.667	133	27	130	26	135	27
6	160.000	26.667	160	27	156	26	162	27
7	186.667	26.667	186	26	182	26	189	27
8	213.333	26.667	213	27	208	26	216	27
9	240.000	26.667	240	27	234	26	243	27
10	266.667	26.667	266	26	260	26	270	27
11	293.333	26.667	293	27	286	26	297	27
12	320.000	26.667	320	27	312	26	324	27
13	346.667	26.667	346	26	338	26	351	27
14	373.333	26.667	373	27	364	26	378	27
15	400.000	26.667	400	27	390	26	405	27
16	426.667	26.667	426	26	416	26	432	27
17	453.333	26.667	453	27	442	26	459	27
18	480.000	26.667	480	27	468	26	486	27
19	506.667	26.667	506	26	494	26	513	27
20	533.333	26.667	533	27	520	26	540	27

To resolve differences in how OGL, PPFA, and PMF handle repeated values, one of the following approaches may be taken:

- Don not use **REPEAT**

or

- Code units as **PEL**(s)

  Note that in all of these products (except PPFA), a **PEL** is 1/240 of an inch. For PPFA, the **PEL** size can be set by the user, but defaults to 1/240 of an inch.

Appendix D. More About Bar Code Parameters

This section contains supplemental information about Bar Code Object Content Architecture (BCOCA) specified by the **BARCODE** subcommand of the **FIELD** command, and includes the following topics:

- Bar code data
- **MOD** parameter

For more complete information, refer to *Data Stream and Object Architectures: Bar Code Object Content Architecture Reference* S544-3766.

Bar Code Data

The data is specified as a series of single-byte code points from a specific code page. Some symbologies limit the valid code points to just the ten numerals (0 through 9), other symbologies allow a richer set of code points. The bar code symbol is produced from these code points; the code points are also used, along with a particular type style, when producing the HRI.

Table 22 lists, for each symbology, the valid code page from which characters are chosen and the type style used when printing HRI in terms of a registered CPGID and FGID. More information about these values can be found in *IBM Advanced Function Presentation Fonts: Font Summary* and in *IBM Advanced Function Presentation: Technical Reference for Code Pages*.

Table 22. Valid Code Pages and Type Styles

Type	Bar Code Symbology	EBCDIC-Based CPGID	FGID
1	Code 39 (3-of-9 Code), AIM USS-39	500	Device specific
2	MSI (modified Plessey code)	500	Device specific
3	UPC/CGPC — Version A	893	3 (OCR-B)
5	UPC/CGPC — Version E	893	3 (OCR-B)
6	UPC — Two-digit Supplemental (Periodicals)	893	3 (OCR-B)
7	UPC — Five-digit Supplemental (Paperbacks)	893	3 (OCR-B)
8	EAN-8 (includes JAN-short)	893	3 (OCR-B)
9	EAN-13 (includes JAN-standard)	893	3 (OCR-B)
10	Industrial 2-of-5	500	Device specific
11	Matrix 2-of-5	500	Device specific
12	Interleaved 2-of-5, AIM USS-I 2/5	500	Device specific
13	Codabar, 2-of-7, AIM USS-Codabar	500	Device specific
17	Code 128, AIM USS-128	1303	Device specific
22	EAN Two-digit Supplemental	893	3 (OCR-B)
23	EAN Five-digit Supplemental	893	3 (OCR-B)
24	POSTNET	500	None
26	RM4SCC	500	None

Table 22. Valid Code Pages and Type Styles (continued)

Type	Bar Code Symbology	EBCDIC-Based CPGID	FGID
27	Japan Postal Bar Code	500	None
28	Data Matrix (2D barcode)	Code page is selectable within the symbol using ECI protocol	None
29	MaxiCode (2D barcode)	Code page is selectable within the symbol using ECI protocol	None
30	PDF417 (2D barcode)	Code page is selectable within the symbol using ECI protocol	None
31	Australia Post Bar Code	Code page is selectable within the symbol using ECI protocol	Device Specific
32	QR Code	Code page is selectable within the symbol using ECI protocol	None
33	Code 93	500	Device Specific
34	USPS Four-State	500	Device Specific

As shown in Table 22 on page 523, the font used to print HRI depends on the symbology. Some symbologies use OCR-B; others use a device-specific font (usually OCR-A).

Table 23 lists the valid characters for each symbology and specifies how many characters are allowed for a bar code symbol.

Table 23. Valid Characters and Data Lengths

Code	Bar Code Type	Valid Characters	Valid Data Length
1	Code 39 (3-of-9 Code), AIM USS-39	0123456789 ABCDEFGHIJKLM NOPQRSTUVWXYZ -.$/+% and the space character A total of 43 valid input characters.	Symbology: unlimited BCOCA range: 0 to 50 characters (see note 1 on page 528)
2	MSI (modified Plessey code)	0123456789	3 to 15 characters for Modifier X'01' 2 to 14 characters for Modifier X'02' 1 to 13 characters for all other modifiers
3	UPC/CGPC - Version A	0123456789	11 characters
5	UPC/CGPC - Version E	0123456789	10 characters

Table 23. Valid Characters and Data Lengths (continued)

Code	Bar Code Type	Valid Characters	Valid Data Length
6	UPC - Two-digit Supplemental (Periodicals)	0123456789	2 characters for Modifier X'00' 13 characters for Modifier X'01' 12 characters for Modifier X'02'
7	UPC - Five-digit Supplemental (Paperbacks)	0123456789	5 characters for Modifier X'00' 16 characters for Modifier X'01' 15 characters for Modifier X'02'
8	EAN-8 (includes JAN-short)	0123456789	7 characters
9	EAN-13 (includes JAN-standard)	0123456789	12 characters
10	Industrial 2-of-5	0123456789	Symbology: unlimited BCOCA range: 0 to 50 characters (see note 1 on page 528)
11	Matrix 2-of-5	0123456789	Symbology: unlimited BCOCA range: 0 to 50 characters (see note 1 on page 528)
12	Interleaved 2-of-5, AIM USS-I 2/5	0123456789	Symbology: unlimited BCOCA range: 0 to 50 characters (see note 1 on page 528)
13	Codabar, 2-of-7, AIM USS-Codabar	0123456789 -$:/.+ABCD 16 characters plus 4 start/stop characters (ABCD) (Note 2 on page 528)	Symbology: unlimited BCOCA range: 0 to 50 characters (see note 1 on page 528)
17	Code 128, AIM USS-128 (modifier X'02')	All characters defined in the Code 128 code page	Symbology: unlimited BCOCA range: 0 to 50 characters (see note 1 on page 528)
	UCC/EAN 128 (modifiers X'03' and X'04')	0123456789 ABCDEFGHIJKLM NOPQRSTUVWXYZ abcdefghijklm nopqrstuvwxyz FNC1	Symbology: unlimited BCOCA range: 0 to 50 characters (see note 1 on page 528)
22	EAN Two-digit Supplemental	0123456789	2 characters for Modifier X'00' 14 characters for Modifier X'01'
23	EAN Five-digit Supplemental	0123456789	5 characters for Modifier X'00' 17 characters for Modifier X'01'
24	POSTNET	0123456789	5 characters for Modifier X'00' 9 characters for Modifier X'01' 11 characters for Modifier X'02' 11 characters for Modifier X'04' BCOCA range for Modifier X'03': 0 to 50 characters (see note 1 on page 528)

Table 23. Valid Characters and Data Lengths (continued)

Code	Bar Code Type	Valid Characters	Valid Data Length
26	Royal Mail (RM4SCC, modifier X'00')	0123456789 ABCDEFGHIJKLM NOPQRSTUVWXYZ	Symbology: unlimited BCOCA range: 0 to 50 characters (see note 1 on page 528)
	Royal Mail (Dutch KIX variation, modifier X'01')	0123456789 ABCDEFGHIJKLM NOPQRSTUVWXYZ abcdefghijklm nopqrstuvwxyz	Symbology: unlimited BCOCA range: 0 to 50 characters (see note 1 on page 528)
27	Japan Postal Bar Code (Modifier X'00')	0123456789 ABCDEFGHIJKLM NOPQRSTUVWXYZ - (hyphen)	Symbology: 7 or more BCOCA range: 7 to 50 characters (see note 1 on page 528)
	Japan Postal Bar Code (Modifier X'01')	0123456789 CC1,CC2,CC3,CC4, CC5,CC6,CC7,CC8 - (hyphen) start, stop	No length checking done; refer to the modifier X'01' description
28	Data Matrix	Any one-byte character or binary data	Symbology: up to 3116 depending on whether the data is character or numeric; refer to the symbology specification BCOCA range: 0 to 3116 characters (see note 1 on page 528)
29	MaxiCode	Any one-byte character allowed by the symbol mode	Symbology: up to 93 alphanumeric characters per symbol depending on encoding overhead or up to 138 numeric characters per symbol; refer to the symbology specification BCOCA range: 0 to 138 characters
30	PDF417	Any one-byte character or binary data	Symbology: up to 1850 text characters, 2710 ASCII numeric digits, or 1108 bytes of binary data per symbol depending on the security level; refer to the symbology specification BCOCA range: 0 to 2710 characters

Table 23. Valid Characters and Data Lengths (continued)

Code	Bar Code Type	Valid Characters	Valid Data Length
31	**Australia Post Bar Code –** refer to the modifier (byte 13) description to see which characters are valid in specific parts of the symbol		
	Modifier X'01' – Standard Customer Barcode	0123456789	Symbology: 8 digits BCOCA range: 8 digits
	Modifier X'02' – Customer Barcode 2 using Table N	0123456789	Symbology: 8–16 digits BCOCA range: 8–16 digits
	Modifier X'03' – Customer Barcode 2 using Table C	0123456789 ABCDEFGHIJKLM NOPQRSTUVWXYZ abcdefghijklm nopqrstuvwxyz (space) # (number sign)	Symbology: 8–13 characters BCOCA range: 8–13 characters
	Modifier X'04' – Customer Barcode 2 using proprietary encoding	0123456789 for sorting code 0–3 for customer information	Symbology: 8–24 digits BCOCA range: 8–24 digits
	Modifier X'05' – Customer Barcode 3 using Table N	0123456789	Symbology: 8–23 digits BCOCA range: 8–23 digits
	Modifier X'06' – Customer Barcode 3 using Table C	0123456789 ABCDEFGHIJKLM NOPQRSTUVWXYZ abcdefghijklm nopqrstuvwxyz (space) # (number sign)	Symbology: 8–18 characters BCOCA range: 8–18 characters
	Modifier X'07' – Customer Barcode 3 using proprietary encoding	0123456789 for sorting code 0–3 for customer information	Symbology: 8–39 digits BCOCA range: 8–39 digits
	Modifier X'08' – Reply Paid Barcode	0123456789	Symbology: 8 digits BCOCA range: 8 digits
32	QR Code	Any one-byte character or binary data	Symbology: Up to 7,089 characters depending on the size and type of the data; refer to the symbology specification BCOCA range: 0 to 7,089 characters
33	Code 93	0123456789 ABCDEFGHIJKLM NOPQRSTUVWXYZ -.$/+% space character a – representing Shift 1 b – representing Shift 2 c – representing Shift 3 d – representing Shift 4 A total of 47 valid input characters.	Symbology: unlimited BCOCA range: 0 to 50 characters (see note 1 on page 528)
34	USPS Four-State	0123456789	20 digits for Modifier X'00' 25 digits for Modifier X'01' 29 digits for Modifier X'02' 31 digits for Modifier X'03'

Table 23. Valid Characters and Data Lengths (continued)

Code	Bar Code Type	Valid Characters	Valid Data Length

Notes:

1. All BCOCA receivers must support at least the BCOCA range. Some receivers support a larger data length.
2. Some descriptions of Codabar show the characters “T,N,*,E” as stop characters (representing the stop characters “A,B,C,D”), but the Codabar symbology actually only allows “A,B,C,D” as start and stop characters. This alternate representation (“T,N,*,E”) is used only to distinguish between the start and stop characters when describing a Codabar symbol; when coding a BCOCA Codabar symbol, start and stop characters must be represented using A, B, C, or D.
3. The data for the UPC and EAN symbologies is numeric and of a fixed length, but not all numbers of the appropriate length are valid. This is because the coding scheme is designed to uniquely identify both a product and its manufacturer. The first part of the symbol represents the manufacturer and is defined in the symbology specification (not all numbers are valid in this part of the symbol). The second part of the symbol represents a unique product identifier code assigned by the manufacturer. Refer to the appropriate symbology specification for more details.

Table 24. Characters and Code Points used in the BCOCA Symbologies; Excluding Code 128

Character	EBCDIC Code Point
0	X'F0'
1	X'F1'
2	X'F2'
3	X'F3'
4	X'F4'
5	X'F5'
6	X'F6'
7	X'F7'
8	X'F8'
9	X'F9'
A	X'C1'
B	X'C2'
C	X'C3'
D	X'C4'
E	X'C5'
F	X'C6'
G	X'C7'
H	X'C8'
I	X'C9'
J	X'D1'
K	X'D2'
L	X'D3'
M	X'D4'
N	X'D5'
O	X'D6'
P	X'D7'

Table 24. Characters and Code Points used in the BCOCA Symbologies; Excluding Code 128 (continued)

Character	EBCDIC Code Point
Q	X'D8'
R	X'D9'
S	X'E2'
T	X'E3'
U	X'E4'
V	X'E5'
W	X'E6'
X	X'E7'
Y	X'E8'
Z	X'E9'
a	X'81'
b	X'82'
c	X'83'
d	X'84'
e	X'85'
f	X'86'
g	X'87'
h	X'88'
i	X'89'
j	X'91'
k	X'92'
l	X'93'
m	X'94'
n	X'95'
o	X'96'
p	X'97'
q	X'98'
r	X'99'
s	X'A2'
t	X'A3'
u	X'A4'
v	X'A5'
w	X'A6'
x	X'A7'
y	X'A8'
z	X'A9'
- (hyphen)	X'60'
# (number sign)	X'7B'
. (period)	X'4B'

Table 24. Characters and Code Points used in the BCOCA Symbologies; Excluding Code 128 (continued)

Character	EBCDIC Code Point
$	X'5B'
/	X'61'
+	X'4E'
%	X'6C'
:	X'7A'
Space	X'40'
FNC1	X'8F'

The Code 128 code page (CPGID = 1303) is defined as shown in Figure 127 on page 531.

Hex DIGITS 1st→ 2nd↓	0-	1-	2-	3-	4-	5-	6-	7-	8-	9-	A-	B-	C-	D-	E-	F-
-0	NUL SE010000	DLE SE170000			(SP) SP010000	& SM030000	– SP100000					^ SD150000	{ SM110000	} SM140000	\ SM070000	0 ND100000
-1	SOH SE020000	DC1 SE180000					/ SP120000		a LA010000	j LJ010000	~ SD190000		A LA020000	J LJ020000		1 ND010000
-2	STX SE030000	DC2 SE190000	FS SE350000	SYN SE230000					b LB010000	k LK010000	s LS010000		B LB020000	K LK020000	S LS020000	2 ND020000
-3	ETX SE040000	DC3 SE200000							c LC010000	l LL010000	t LT010000		C LC020000	L LL020000	T LT020000	3 ND030000
-4									d LD010000	m LM010000	u LU010000		D LD020000	M LM020000	U LU020000	4 ND040000
-5	HT SE100000		LF SE110000						e LE010000	n LN010000	v LV010000		E LE020000	N LN020000	V LV020000	5 ND050000
-6		BS SE090000	ETB SE240000						f LF010000	o LO010000	w LW010000		F LF020000	O LO020000	W LW020000	6 ND060000
-7			ESC SE280000	EOT SE050000					g LG010000	p LP010000	x LX010000		G LG020000	P LP020000	X LX020000	7 ND070000
-8		CAN SE250000							h LH010000	q LQ010000	y LY010000		H LH020000	Q LQ020000	Y LY020000	8 ND080000
-9		EM SE260000						` SD130000	i LI010000	r LR010000	z LZ010000		I LI020000	R LR020000	Z LZ020000	9 ND090000
-A						! SP020000		: SP130000				[SM060000			FN2 SE400000	FN3 SE410000
-B	VT SE120000				. SP110000	$ SC030000	, SP080000	# SM010000				] SM080000				
-C	FF SE130000			DC4 SE210000	< SA030000	* SM040000	% SM020000	@ SM050000								
-D	CR SE140000	GS SE360000	ENQ SE060000	NAK SE220000	(SP060000	) SP070000	_ SP090000	’ SP050000								
-E	SO SE150000	RS SE370000	ACK SE070000		+ SA010000	; SP140000	> SA050000	= SA040000				FN4 SE420000				
-F	SI SE160000	US SE380000	BEL SE080000	SUB SE270000	| SO130000		? SP150000	" SP040000	FN1 SE390000							DEL SE330000

Figure 127. Code 128 Code Page (CPGID = 1303)

Note: All START, STOP, SHIFT, and CODE characters are generated by the printer to produce the shortest bar code possible from the given data; these characters are not specified in the Bar Code Symbol Data. All code points not listed in the table are undefined. The code points that do not have graphic character shapes, such as X'00' (NUL) and X'8F' (FN1), are control codes defined within the Code 128 symbology; in the HRI, control codes print in a device-dependent manner. The FN1, FN2, FN3, and FN4 characters are also called FNC1, FNC2, FNC3, and FNC4 in the Code 128 Symbology Specification.

MOD Parameter

The modifier field gives additional processing information about the bar code symbol to be generated. For example, it indicates whether a check-digit is to be generated for the bar code symbol.

Table 25 shows the modifier values for each bar code type.

Table 25. Modifier Values by Bar Code Type

Bar Code Type	MOD Value
1 – Code 39 (3-of-9 Code), AIM USS-39	X'01' and X'02'
2 – MSI (modified Plessey code)	X'01' through X'09'
3 – UPC/CGPC Version A	X'00'
5 – UPC/CGPC Version E	X'00'
6 – UPC - Two-digit Supplemental	X'00' - X'02'
7 – UPC - Five-digit Supplemental	X'00' - X'02'
8 – EAN 8 (includes JAN-short)	X'00'
9 – EAN 13 (includes JAN-standard)	X'00'
10 – Industrial 2-of-5	X'01' and X'02'
11 – Matrix 2-of-5	X'01' and X'02'
12 – Interleaved 2-of-5, AIM USS-I 2/5	X'01' through X'04'
13 – Codabar, 2-of-7, AIM USS-Codabar	X'01' and X'02'
17 – Code 128, AIM USS-128	X'02' through X'05'
22 – EAN Two-digit Supplemental	X'00' and X'01'
23 – EAN Five-digit Supplemental	X'00' and X'01'
24 – POSTNET	X'00' through X'04'
26 – RM4SCC	X'00' and X'01'
27 – Japan Postal Bar Code	X'00' and X'01'
28 – DataMatrix two-dimensional Bar Code	X'00'
29 – MaxiCode two-dimensional Bar Code	X'00'
30 – PDF417 two-dimensional Bar Code	X'00' and X'01'
31 – Australia Postal Bar Code	X'01' - X'08'
32 – QR CODE two-dimensional Bar Code	X'02'
33 – CODE 93	X'00'
34 – USPS Four-State	X'00' through X'03'
35 – Red Tag	X'00'
36 – GS1 DataBar	X'00' through X'04' and X'11' through X'1B'

The modifier values, by bar code type, are as follows:

Code 39 (3-of-9 Code), AIM USS-39

39OR93W

Code 39 (3-of-9 Code)
(encoding 39OR93 with check character
yielding a 2.32 inch wide symbol)

X'01' Present the bar code without a generated check digit.

X'02' Generate a check digit and present it with the bar code.

Note: The Code 39 character set contains 43 characters including numbers, upper-case alphabetics, and some special characters. The Code 39 Specification also provides a method of encoding all 128 ASCII characters by using 2 bar code characters for those ASCII characters that are not in the standard Code 39 character set. This is sometimes referred to as "Extended Code 39" and is supported by all BCOCA receivers. In this case, the 2 bar code characters used to specify the "extended character" is shown in the Human-Readable Interpretation and the bar code scanner interprets the 2-character combination bar/space pattern appropriately.

MSI (modified Plessey code)

80523

MSI - no check digit
(encoding 80523)

X'01' Present the bar code without check digits generated by the printer. Specify 3 to 15 digits of input data.

X'02' Present the bar code with a generated IBM modulo-10 check digit. This check digit is the second check digit; the first check digit is the last character of the data as defined in the associated FIELD START and LENGTH subcommands. Specify 2 to 14 digits of input data.

X'03' Present the bar code with two check digits. Both check digits are generated using the IBM modulo-10 algorithm. Specify 1 to 13 digits of input data.

X'04' Present the bar code with two check digits. The first check digit is generated using the NCR modulo-11 algorithm; the second using the IBM modulo-10 algorithm. The first check digit equals the remainder; exception condition EC-0E00 exists if the first check-digit calculation results in a value of 10. Specify 1 to 13 digits of input data.

X'05' Present the bar code with two check digits. The first check digit is generated using the IBM modulo-11 algorithm; the second using the IBM modulo-10 algorithm. The first check digit equals the remainder; exception condition EC-0E00 exists if the first check-digit calculation results in a value of 10. Specify 1 to 13 digits of input data.

X'06' Present the bar code with two check digits. The first check digit is generated using the NCR modulo-11 algorithm; the second using the IBM modulo-10 algorithm. The first check digit equals 11 minus the remainder; a first check digit value of 10 is assigned the value zero. Specify 1 to 13 digits of input data.

X'07' Present the bar code with two check digits. The first check digit is generated using the IBM modulo-11 algorithm; the second using the IBM modulo-10 algorithm. The first check digit equals 11 minus the remainder; a first check digit value of 10 is assigned the value zero. Specify 1 to 13 digits of input data.

X'08' Present the bar code with two check digits. The first check digit is generated using the NCR modulo-11 algorithm; the second using the IBM modulo-10 algorithm. The first check digit equals 11 minus the remainder; exception condition EC-0E00 exists if the first check-digit calculation results in a value of 10. Specify 1 to 13 digits of input data.

X'09' Present the bar code with two check digits. The first check digit is generated using the IBM modulo-11 algorithm; the second using the IBM modulo-10 algorithm. The first check digit equals 11 minus the remainder; exception condition EC-0E00 exists if the first check-digit calculation results in a value of 10. Specify 1 to 13 digits of input data.

UPC/CGPC—Version A

0 12345 67890 5

UPC Version A
(encoding 01234567890)

X'00' Present the standard UPC-A bar code with a generated check digit. The data to be encoded consists of eleven digits. The first digit is the number-system digit; the next ten digits are the article number.

Specify 11 digits of input data. The first digit is the number system character; the remaining digits are information characters.

UPC/CGPC—Version E

0 078349 1

UPC Version E
(encoding 078349)

X'00' Present a UPC-E bar code symbol. Of the 10 input digits, six digits are encoded. The check digit is generated using all 10 input data digits. The check digit is not encoded; it is only used to assign odd or even parity to the six encoded digits.

Specify 10 digits of input data. Version E suppresses some zeros that can occur in the information characters to produce a shorter symbol. All 10 digits are information characters; the number system character should not be specified (it is assumed to be 0).

UPC—Two-Digit Supplemental

UPC A + Two-digit Supplemental
(encoding 00633895260, supplemental = 24)

X'00' Present a UPC two-digit supplemental bar code symbol. This option assumes that the base UPC Version A or E symbol is presented as a separate bar code object. The bar and space patterns used for the two supplemental digits are left-odd or left-even parity, with the parity determined by the digit combination.

Specify 2 digits of input data.

X'01' The two-digit UPC supplemental bar code symbol is preceded by a UPC Version A, Number System 0, bar code symbol. The bar code object contains both the UPC Version A symbol and the two-digit supplemental symbol. The input data consists of the number system digit, the ten-digit article number, and the two supplement digits, in that order. A check digit is generated for the UPC Version A symbol. The two-digit supplemental bar code is presented after the UPC Version A symbol using left-hand odd and even parity as determined by the two supplemental digits.

Specify 13 digits of input data.

X'02' The two-digit UPC supplemental bar code symbol is preceded by a UPC Version E symbol. The bar code object contains both the UPC Version E symbol and the two-digit supplemental symbol. The input data consists of the ten-digit article number and the two supplemental digits. The bar code object processor generates the six-digit UPC Version E symbol and a check digit. The check digit is used to determine the parity pattern of the six-digit Version E symbol. The two-digit supplemental bar code symbol is presented after the Version E symbol using left-hand odd and even parity as determined by the two digits.

Specify 12 digits of input data.

UPC—Five-Digit Supplemental

UPC A + Five-digit Supplemental
(encoding 09827721123, supplemental = 21826)

X'00' Present the UPC five-digit supplemental bar code symbol. This option assumes that the base UPC Version A or E symbol is presented as a separate bar code object. A check digit is generated from the five supplemental digits and is used to assign the left-odd and left-even parity of the five-digit supplemental bar code. The supplemental check digit is not encoded or interpreted.

Specify 5 digits of input data.

X'01' The five-digit UPC supplemental bar code symbol is preceded by a UPC Version A, Number System 0, bar code symbol. The bar code object contains both the UPC Version A symbol and the five-digit supplemental symbol. The input data consists of the number system digit, the ten-digit article number, and the five supplement digits, in that order. A check digit is generated for the UPC Version A symbol. A second check digit is generated from the five supplement digits. It is used to assign the left-hand odd and even parity of the five-digit supplemental bar code symbol. The supplement check digit is not encoded or interpreted.

Specify 16 digits of input data.

X'02' The five-digit UPC supplemental bar code symbol is preceded by a UPC Version E symbol. The bar code object contains both the UPC Version E symbol and the five-digit supplemental symbol. The input data consists of the ten-digit article number and the five-digit supplemental data. The bar code object processor generates the six-digit UPC Version E symbol and check digit. The check digit is used to determine the parity pattern of the Version E symbol. The five-digit supplemental bar code symbol is presented after the Version E symbol. A second check digit is calculated for the five-digit supplemental data and is used to assign the left-hand odd and even parity. The supplement check digit is not encoded or interpreted.

Specify 15 digits of input data.

EAN-8 (includes JAN-short)

EAN 8
(encoding 2468123)

X'00' Present an EAN-8 bar code symbol. The input data consists of seven digits: two flag digits and five article number digits. All seven digits are encoded along with a generated check digit.

EAN-13 (includes JAN-standard)

0 412345 678903

EAN 13
(encoding 041234567890)

X'00' Present an EAN-13 bar code symbol. The input data consists of twelve digits: two flag digits and ten article number digits, in that order. The first flag digit is not encoded. The second flag digit, the article number digits, and generated check digit are encoded. The first flag digit is presented in HRI form at the bottom of the left *quiet zone*. The first flag digit governs the A and B number-set pattern of the bar and space coding of the six digits to the left of the symbol center pattern.

Industrial 2-of-5

54321068

Industrial 2-of-5
(encoding 54321068)

X'01' Present the bar code without a generated check digit.

X'02' Generate a check digit and present it with the bar code.

Matrix 2-of-5

54321068

Matrix 2-of-5
(encoding 54321068)

X'01' Present the bar code symbol without a generated check digit.

X'02' Generate a check digit and present it with the bar code.

Interleaved 2-of-5, AIM USS-I 2/5

54321068

Interleaved 2-of-5
(encoding 54321068)

The Interleaved 2-of-5 symbology requires an even number of digits. The printer adds a leading zero if necessary in order to meet this requirement.

X'01' Present the bar code symbol without a check digit.

X'02' Generate a check digit and present it with the bar code.

Codabar, 2-of-7, AIM USS-Codabar

34698735

Codabar
(encoding A34698735B)

X'01' Present the bar code without a generated check digit. The input data consists of a start character, digits to be encoded, and a stop character, in that order. Start and stop characters can be A, B, C, or D, and can only be used at the beginning and end of the symbol.

X'02' Generate a check digit and present it with the bar code. The input data consists of a start character, digits to be encoded, and a stop character, in that order. Start and stop characters can be A, B, C, or D, and can only be used at the beginning and end of the symbol.

Code 128, AIM USS-128 (modifier values X'02' through X'04')

The 1986 symbology definition for Code 128 defined an algorithm for generating a start character and then changed that algorithm in 1993 to accommodate the UCC/EAN 128 variation of this bar code. Many BCOCA printers have implemented the 1986 version (using modifier X'02'), some BCOCA printers have changed to use the 1993 algorithm (with modifier X'02'), and some BCOCA printers support both algorithms. When producing UCC/EAN 128 bar codes for printers that explicitly support UCC/EAN 128, modifier X'03' or modifier X'04' should be specified. For printers that do not explicitly support UCC/EAN 128, specifying modifier X'02' might produce a valid UCC/EAN 128 bar code (see notes in the modifier descriptions).

The data for UCC/EAN 128 bar codes is in the form:

```
"FNC1, ai, data, m, FNC1, ai, data, m, FNC1, ..., ai, data, m"
```

where “FNC1” is the FNC1 function character (X'8F'), “ai” is an application identifier, “data” is defined for each registered application identifier, and “m” is a modulo 10 check digit (calculated using the same check digit algorithm as is used for UPC version A bar codes); note that not all application identifiers require a modulo 10 check digit (m). Also, note that all except the first"FNC1" are field separator characters that only appear when the preceding ai data is of variable length. Refer to *UCC/EAN-128 APPLICATION IDENTIFIER STANDARD* from the Uniform Code Council, Inc. for a description of application identifiers and the use of "FNC1". When building the bar code symbol, the printer will:

1. produce a start character based on the 1993 algorithm
2. bar encode the data including all of the "FNC1", "ai", "data", and "m" check digit
3. produce a modulo 103 check digit
4. produce a stop character.

Modifier X'02' – Code 128 symbol, using original (1986) start-character algorithm

A B C 1 2 3 a b c @4 5 6

Code 128
(encoding ABC123abc@456)

Generate a Code 128 symbol using subset A, B, or C as appropriate to produce the shortest possible bar code from the given data, using the start-character algorithm that was published in the original (1986) edition of the Code 128 Symbology Specification. The Code 128 code page (CPGID = 1303, GCSGID = 1454) is used to interpret the bar code symbol data. Generate a check digit and present it with the bar code.

Notes:

1. Some IPDS printers use the modifier X'03' start-character algorithm even when modifier X'02' is specified; this produces a valid UCC/EAN 128 symbol when valid UCC/EAN 128 data is provided. However, in general, modifier X'02' should not be used to produce UCC/EAN 128 symbols since this value causes other IPDS printers to use the original Code 128 start-symbol algorithm which will generate a Start (Code B) instead of the Start (Code C) that UCC/EAN 128 requires. Some bar code scanners can handle either start character for a UCC/EAN 128 symbol, but others require the Start (Code C) character.
2. Printers that use the UCC/EAN 128 start-character algorithm when modifier X'02' is specified include: 4312, 4317, 4324, InfoPrint 20, InfoPrint 21, InfoPrint 32, InfoPrint 40, InfoPrint 45, InfoPrint 70, InfoPrint 2070, InfoPrint 2085, and InfoPrint 2105. Other IPDS printers use the original start-character algorithm when modifier X'02' is specified.

Modifier X'03' – UCC/EAN 128 symbol, without parenthesis in the HRI

019061414100768715001230

SCC-14 and Sell-By Date Concatenated in a **UCC/EAN-128 Symbol**

(encoding FNC1 019061414100768715001230)

Generate a Code 128 symbol using subset A, B, or C as appropriate to produce the shortest possible bar code from the given data, using the version of the start-character algorithm that was modified for producing UCC/EAN 128 symbols. If the first data character is FNC1 (as is required for a UCC/EAN 128 symbol) and is followed by valid UCC/EAN 128 data, the printer will generate a Start (Code C) character. The Code 128 code page (CPGID = 1303, GCSGID = 1454) is used to interpret the bar code symbol data. Generate a check digit and present it with the bar code.

The UCC/EAN 128 data is checked for validity and exception condition EC-1200 exists if one or more of the following conditions are encountered:

- FNC1 is not the first data character
- Invalid application identifier (ai) value encountered
- Data for an ai doesn't match the ai definition
- Insufficient (or no) data following an ai
- Too much data for an ai
- Invalid use of FNC1 character

Notes:

1. UCC/EAN 128 is a variation of Code 128 that begins with a FNC1 character, followed by an Application Identifier and the data to be bar encoded. All of these characters (including the FNC1 character) must be supplied within the Bar Code Symbol Data (BSA). UCC/EAN 128 also requires that the symbol begin in subset C.
2. For UCC/EAN 128 symbols, the start character, the FNC1 characters, the modulo 103 check digit, and the stop character are not shown in the human readable format.

Modifier X'04' – UCC/EAN 128 symbol, with parenthesis in the HRI

(01)90614141007687(15)001230

SCC-14 and Sell-By Date Concatenated in a **UCC/EAN-128 Symbol**

(encoding FNC1 019061414100768715001230)

Generate a Code 128 symbol in the same manner as for modifier X'03', but use parenthesis in the HRI to distinguish each application identifier (ai). The printer inserts the parenthesis in the printed HRI when modifier X'04' is specified; these parentheses are not part of the input data.

EAN Two-Digit Supplemental

EAN + 2 Digit Supplemental
(encoding 041234567890, supplemental = 99)

X'00' Present the EAN two-digit supplemental bar code symbol. This option assumes that the base EAN-13 symbol is presented as a separate bar code object. The value of the two digit supplemental data determines their bar and space patterns chosen from number sets A and B.

Specify 2 digits of input data.

X'01' The two-digit supplemental bar code symbol is preceded by a normal EAN-13 bar code symbol. The bar code object contains both the EAN-13 symbol and the two-digit supplemental symbol. The two-digit supplemental bar code is presented after the EAN-13 symbol using left hand odd and even parity as determined by the two supplemental digits chosen from number sets A and B.

Specify 14 digits of input data.

Note: Used for both books and paperbacks.

EAN Five-Digit Supplemental

EAN + 5 Digit Supplemental
(encoding 041234567890, supplemental = 54321)

X'00' Present the EAN five-digit supplemental bar code. This option assumes that the base EAN-13 symbol is presented as a separate bar code object. A check digit is calculated from the five supplemental digits. The check digit is also used to assign the bar and space patterns from number sets A and B for the five supplemental digits. The check digit is not encoded or interpreted.

Specify 5 digits of input data.

X'01' The five-digit supplemental bar code symbol is preceded by a normal EAN-13 bar code symbol. The bar code object contains both the EAN-13 symbol and the five-digit supplemental symbol. A check digit is generated from the five-digit supplemental data. The check digit is used to assign the bar and space patterns from number sets A and B. The check digit is not encoded or interpreted.

Specify 17 digits of input data.

Note: Used for books and paperbacks.

POSTNET and PLANET

US POSTNET
Zip+4
(encoding 12345+6789)

PLANET Code
(encoding 00123456789)

For all POSTNET modifiers that follow, the BSA HRI flag field and the BSD module width, element height, height multiplier, and wide-to-narrow ratio fields are not applicable to the POSTNET bar code symbology. These fields are ignored because the POSTNET symbology defines specific values for these parameters.

X'00' Present a POSTNET ZIP Code bar code symbol. The ZIP Code to be encoded is defined as a five-digit, numeric (0–9), data variable to the BSA data structure. The POSTNET ZIP Code bar code consists of a leading frame bar, the encoded ZIP Code data, a correction digit, and a trailing frame bar.

X'01' Present a POSTNET ZIP+4 bar code symbol. The ZIP+4 code to be encoded is defined as a nine-digit, numeric (0–9), data variable to the BSA data structure. The POSTNET ZIP+4 bar code consists of a leading frame bar, the encoded ZIP+4 data, a correction digit, and a trailing frame bar.

X'02' Present a POSTNET Advanced Bar Code (ABC) bar code symbol. The ABC code to be encoded is defined as an eleven-digit, numeric (0–9), data variable to the BSA data structure. The POSTNET ABC bar code consists of a leading frame bar, the encoded ABC data, a correction digit, and a trailing frame bar.

Note: An 11-digit POSTNET bar code is called a *Delivery Point bar code*.

X'03' Present a POSTNET variable-length bar code symbol. The data to be encoded is defined as an n-digit, numeric (0–9), data variable to the BSA data structure. The bar code symbol is generated without length checking; the symbol is not guaranteed to be scannable or interpretable. The POSTNET variable-length bar code consists of a leading frame bar, the encoded data, a correction digit, and a trailing frame bar.

X'04' Present a PLANET Code symbol. The PLANET Code is a reverse topology variation of POSTNET that encodes 11 digits of data; the first 2 digits represent a service code (such as, 21 = Origin Confirm and 22 = Destination Confirm) and the next 9 digits identify the mailpiece. A 12th digit is generated by the printer as a check digit. The PLANET Code symbol consists of a leading frame bar, the encoded data, a check digit, and a trailing frame bar.

Royal Mail (RM4SCC and Dutch KIX)

Royal Mail (RM4SCC)
UK and Singapore version
(encoding SN34RD1A)

Royal Mail (RM4SCC)
Dutch KIX version
(encoding SN34RD1A)

A 4 state customer code defined by the Royal Mail Postal service of England for use in bar coding postal code information. This symbology is also called the *Royal Mail bar code* or the *4-State customer code*. The symbology (as defined for modifier X'00') is used in the United Kingdom and in Singapore. A variation called KIX (KlantenIndeX = customer index, as defined for modifier X'01') is used in the Netherlands.

X'00' Present a RM4SCC bar code symbol with a generated start bit, checksum character, and stop bit. The start and stop bits identify the beginning and end of the bar code symbol and also the orientation of the symbol.

X'01' Present a RM4SCC bar code symbol with no start bar, no checksum character, and no stop bar.

Note: Modifier X'01' is also known as “Dutch Kix Postal Bar Code”. In addition to the characters allowed in Modifier X'00', it allows lowercase alphabetical characters which are folded to uppercase by the printer.

Japan Postal Bar Code (JPOSTAL)

Japan Postal Bar Code

Modifier X'00'

(encoding 15400233-16-4)

A complete Japan Postal Bar Code symbol consisting of a set of distinct bars and spaces for each character, followed by a modulo 19 checksum character and enclosed by a unique start character, stop character, and quiet zones.

X'00' Present a Japan Postal Bar Code symbol with a generated start character, checksum character, and stop character.

The generated bar code symbol consists of a start code, a 7-digit new postal code, a 13-digit address indication number, a check digit, and a stop code. The variable data to be encoded (BSA bytes 5-n) is used as follows:

1. The first few digits represent the new postal code in either the form nnn-nnnn or the form nnnnnnn; the hyphen, if present, is ignored and the other 7 digits must be numeric. The 7 digits are placed in the new postal code field of the bar code symbol.
2. If the next digit is a hyphen, it is ignored and is not used in generating the bar code symbol.
3. The remainder of the BSA data is the address indication number, which can contain numbers, hyphens, and alphabetic characters (A-Z). Each number and each hyphen represents one digit in the bar code symbol; each alphabetic character is represented by a combination of a control code (CC1, CC2, or CC3) and a numerical code, and handled as two digits in the bar code symbol. Thirteen digits of this address indication number data are placed in the address indication number field of the bar code symbol.
   - If less than 13 additional digits are present, the shortage is filled in with the bar code corresponding to control code CC4 up to the thirteenth digit.

- If more than 13 additional digits are present, the first 13 are used and the remainder ignored, with no exception condition reported. However, if the thirteenth digit is the control code for an alphabetic (A-Z) character, only the control code is included and the numeric part is omitted.

X'01' Present a Japan Postal Bar Code symbol directly from the bar code data. Each valid character in the BSA data field is converted into a bar/space pattern, with no validity or length checking. The printer does not generate start, stop, or check digits.

To produce a valid bar code symbol, the bar code data must contain a start code, a 7-digit new postal code, a 13-digit address indication number, a valid check digit, and a stop code. The new postal code must consist of 7 numeric digits. The address indication number must consist of 13 characters, which can be numeric, hyphen, or control characters (CC1 through CC8). The following table lists the valid code points for modifier X'01':

Table 26. Valid EBCDIC-based Code Points for Japan Postal Bar Code

Bar Code Character	Code Point	Numerical Checking Value	Bar Code Character	Code Point	Numerical Checking Value
start	X'4C'		0	X'F0'	0
stop	X'6E'		1	X'F1'	1
hyphen	X'60'	10	2	X'F2'	2
CC1	X'5A'	11	3	X'F3'	3
CC2	X'7F'	12	4	X'F4'	4
CC3	X'7B'	13	5	X'F5'	5
CC4	X'E0'	14	6	X'F6'	6
CC5	X'6C'	15	7	X'F7'	7
CC6	X'50'	16	8	X'F8'	8
CC7	X'7D'	17	9	X'F9'	9
CC8	X'4D'	18			

Notes:

1. Do not attempt to use the Start and Stop characters in calculating the check digit. You can use the remaining characters to generate check digits; they are the only characters that are valid for check digits. Use the Numeric Checking Values to calculate the check digits.

Note: You supply data generation for mod 1. The check digit is the sum of the digits modulo 19, which is a remainder of X. The check digit is 19 minus X, converted to hex. If this is done incorrectly, the print server displays message ‘APS830I’.

The hyphen has a hex value of X'60' and a checking digit numerical of 10.

The following example is a generation of the customer bar code:

```
address
   154
   3-16-4, Wakabayshi, Setagaya-ku

New postal code + address indication number:

   154-0023-3-16-4
```

where, at this point, 154-0023 is the new postal code and 3 - 1 6 - 4 is the address indication number.

Delete hyphens between the third and fourth digits of the new postal code and between the new postal code and address indication number, as follows:

```
   15400233-16-4
```

If the address indication number is shorter than 13 digits, use CC4s to fill the remaining spaces, as in the following example.

```
   15400233-16-4 CC4 CC4 CC4 CC4 CC4 CC4 CC4
```

The first 7 digits are ignored as the postal code and the remaining digits are the address indication number. Remember to count hyphens as digits. In the previous example, the postal code is 1540023 and the address indication number is 3 - 1 6 - 4 plus seven CC4 characters.

Calculate the check digit (CD), based on the table of correspondence between characters for bar code and checking numerals. See Table 26 on page 544 for more information about check digits.

1+5+4+0+0+2+3+3+10+1+6+10+4+14+14+14+14+14+14+14+CD = 147 + CD = integral multiple of 19. Using the integral multiple of 19, 152 − 147 = 5 for the check digit, based on the table of correspondence between characters for bar code and checking numerals. Five corresponds to checking numerical five.

For the previous postal code and address indication number, calculate the hex value of the check digit. The following table shows how to convert the data to hex values. Add the check digit (CD), start code (STC), and stop code (SPC), as follows:

Table 27. Table Shows How to Convert Data to Hex Values.

Start Code (STC)	**HEX**
1	F1
5	F5
4	F4
0	F0
0	F0
2	F2
3	F3

Table 27. Table Shows How to Convert Data to Hex Values. (continued)

Start Code (STC)	HEX
3	F3
-	60
1	F1
6	F6
-	60
4	F4
CC4	E0
CC4	E0
CC4	E0
CC4	E0
CC4	E0
CC4	E0
CC4	E0
CD(5)	F5
SPC	6E

Notice that the check digit (CD) equals 5 and is converted to the hex value of F5.

The following are examples of various Japanese postal barcodes.

```
PAGEDEF SLSRPT;
   PRINTLINE POSITION 2 IN 2 IN;
   FIELD START 1 LENGTH 23
   POSITION CURRENT NEXT
   DIRECTION ACROSS
   BARCODE JAPAN  TYPE JPOSTAL MOD 1;
```

This barcode used numeric postal codes only. The 7-digit field contains the start, stop, and checksum characters. The printer does not generate start, stop, or checksum characters.

```
PAGEDEF SLSRPT;
   PRINTLINE POSITION 2 IN 2 IN;
   FIELD START 1 LENGTH 23
   POSITION CURRENT NEXT
   DIRECTION ACROSS
   BARCODE JAPAN  TYPE JPOSTAL MOD 1;
```

This barcode used alphanumeric postal codes only. The 13-digit field contains start, stop, checksum, and command codes. The printer does not generate start, stop, or checksum characters.

```
PAGEDEF SLSRPT;
   PRINTLINE POSITION 2 IN 2 IN;
   FIELD START 1 LENGTH 7
   POSITION CURRENT NEXT
   DIRECTION ACROSS
   BARCODE JAPAN  TYPE JPOSTAL MOD 0;
```

This barcode used numeric postal codes only. This is a 7-digit character field.

```
PAGEDEF SLSRPT;
   PRINTLINE POSITION 2 IN 2 IN;
   FIELD START 1 LENGTH 13
   POSITION CURRENT NEXT
   DIRECTION ACROSS
   BARCODE JAPAN  TYPE JPOSTAL MOD 0;
```

This barcode used alphanumeric postal codes only. This is a 13-digit character field.

Data Matrix (2DMATRIX)

Data Matrix 2D Symbol
(encoding A1B2C3D4E5F6G7H8I9J0K1L2)

A two-dimensional matrix bar code symbology defined as an AIM International Symbology Specification.

X'00' Present a Data Matrix Bar Code symbol using Error Checking and Correcting (ECC) algorithm 200.

The bar code data is assumed to start with the default character encodation (ECI 000003 = ISO 8859-1). This is an international Latin 1 code page that is equivalent to the ASCII code page 819. To change to a different character encodation within the data, the ECI protocol as defined in the *AIM International Symbology Specification - Data Matrix*, must be used. This means that whenever a byte value of X'5C' (an escape code) is encountered in the bar code data, the next six characters must be decimal digits (byte values X'30' to X'39') or the next character must be another X'5C'. When the X'5C' character is followed by six decimal digits, the six decimal digits are interpreted as the ECI number which changes the interpretation of the characters that follow the decimal digits. When the X'5C' character is followed by another X'5C' character, this is interpreted as one X'5C' character (which is a backslash in the default character encodation); alternatively, the escape-sequence handling flag can be used to treat X'5C' as a normal character.

Since the default character encodation for this bar code is ASCII, the EBCDIC-to-ASCII translation flag can be used when all of the data for the bar code is EBCDIC. If the bar code data contains more than one character encodation or if the data needs to be encoded within the bar code symbol in a form other than the default character encodation (such as, in EBCDIC), the bar code data should begin in the default encodation, the EBCDIC-to-ASCII translation flag should be set to B'0', and the ECI protocol should be used to switch into the other encodation.

Note: For more information about **2DMATRIX** two-dimensional matrix bar codes, see “Data Matrix Special-Function Parameters” on page 564.

MaxiCode (2DMAXI)

MaxiCode 2D Symbol

A two-dimensional matrix bar code symbology defined as an AIM International Symbology Specification.

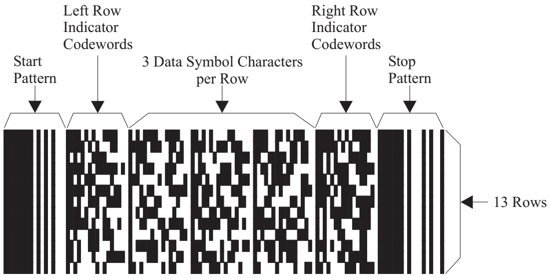
X'00' Present a MaxiCode bar code symbol.

The bar code data is assumed to start with the default character encodation (ECI 000003 = ISO 8859-1). This is an international Latin 1 code page that is equivalent to the ASCII code page 819. To change to a different character encodation within the data, the ECI protocol as defined in section 4.15.2 of the *AIM International Symbology Specification - MaxiCode*, must be used. This means that whenever a byte value of X'5C' (an escape code) is encountered in the bar code data, the next six characters must be decimal digits (byte values X'30' to X'39') or the next character must be another X'5C'. When the X'5C' character is followed by six decimal digits, the six decimal digits are interpreted as the ECI number which changes the interpretation of the characters that follow the decimal digits. When the X'5C' character is followed by another X'5C' character, this is interpreted as one X'5C' character (which is a backslash in the default character encodation); alternatively, the escape-sequence handling flag can be used to treat X'5C' as a normal character. The X'5C' character is allowed anywhere in the bar code data except for Modes 2 and 3 where it is not allowed in the Primary Message portion of the data.

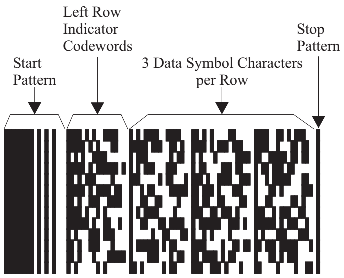
Since the default character encodation for this bar code is ASCII, the EBCDIC-to-ASCII translation flag can be used when all of the data for the bar code is EBCDIC. If the bar code data contains more than one character encodation or if the data needs to be encoded within the bar code symbol in a form other than the default character encodation (such as, in EBCDIC), the bar code data should begin in the default encodation, the EBCDIC-to-ASCII translation flag should be set to B'0', and the ECI protocol should be used to switch into the other encodation.

Note: For more information about **2DMAXI** two-dimensional matrix bar codes.

2DPDF417



PDF417



Truncated PDF417

A two-dimensional matrix bar code symbology defined as an *AIM International Symbology Specification — PDF417*.

X'00' Present a full PDF417 bar code symbol.

X'01' Present a truncated PDF417 bar code symbol for use in an environment in which damage to the symbol is unlikely. This version omits the right row indicator and simplifies the stop pattern into a single module width bar.

The bar code data is assumed to start with the default character encodation (GLI 0) as defined in Table 5 of the Uniform Symbology Specification PDF417. To change to another character encodation, the GLI (Global Label Identifier) protocol, as defined in the Uniform Symbology Specification PDF417, must be used. This means that whenever a byte value of X'5C' (an escape code) is encountered in the bar code data, the next three characters must be decimal digits (byte values X'30' to X'39') or the next character must be another X'5C' character. When the X'5C' character is followed by three decimal digits, this is called an escape sequence. When the X'5C' character is followed by another X'5C' character, this is interpreted as one X'5C' character (which is a backslash in the default character encodation); alternatively, the escape-sequence handling flag can be used to treat X'5C' as a normal character.

To identify a new GLI, there must be two or three escape sequences in a row. The first escape sequence must be "\925", "\926", or "\927" (as defined by GLI 0). If the first escape sequence is "\925" or "\927", there must be one other escape sequence following containing a value from "\000" to "\899". If the first escape sequence is "\926", there must be two more escape sequences following with each escape sequence containing a value from "\000" to "\899". For example, to switch to GLI 1 (ISO 8859-1 which is equivalent to ASCII code page 819), the bar code data would contain the character sequence "\927\001". The "\927" escape sequence is used for GLI values from 0 to 899. The "\926" escape sequence is used for GLI values from 900 to 810,899. The "\925" escape sequence is used for GLI values from 810,900 to 811,799. For more information about how these values are calculated refer to section 2.2.6 of the Uniform Symbology Specification PDF417.

In addition to transmitting GLI numbers, the escape sequence is used to transmit other codewords for additional purposes. The special codewords are given in Table 8 in Section 2.7 of the Uniform Symbology Specification PDF417. The special codewords "\903" to "\912" and "\914" to "\920" are reserved for future use. The BCOCA receiver will accept these special escape sequences and add them to the bar code symbol, resuming with normal encoding with the character following that escape sequence.

The special codeword "\921" instructs the bar code reader to interpret the data contained within the symbol for reader initialization or programming. This escape sequence is only allowed at the beginning of the bar code data.

The special codewords "\922", "\923", and "\928" are used for coding a Macro PDF417 Control Block as defined in section G.2 of the Uniform Symbology Specification PDF417. These codewords must not be used within the BCOCA data; instead a Macro PDF417 Control Block can be specified in the special-function parameters. Exception condition EC-2100 exists if one of these escape sequences is found in the bar code data.

Since the default character encodation for this bar code is GLI 0 (an ASCII code page that is similar to IBM code page 437), the EBCDIC-to-ASCII translation flag can be used when all of the data for the bar code is EBCDIC. If the bar code data contains more than one character encodation, or if the data needs to be encoded within the bar code symbol in a form other than the default character encodation (such as, in EBCDIC), the bar code data should begin in the default encodation, the EBCDIC-to-ASCII translation flag should be set to B'0', and the GLI protocol should be used to switch into the other encodation.

Note: For more information about **2DPDF417** two-dimensional matrix bar codes, see "PDF417 Special-Function Parameters" on page 573.

Australia Post Bar Code (APOSTAL)

Australia Post Bar Code
Customer Barcode 2 using Table C
(encoding 56439111ABA 9)

A bar code symbology defined by Australia Post for use in Australian postal systems. There are several formats of this bar code which are identified by the modifier byte as follows:

Modifier	Type of bar code	Valid bar code data
X'01'	Standard Customer Barcode (format code = 11)	An 8 digit number representing the Sorting Code
X'02'	Customer Barcode 2 using Table N (format code = 59)	An 8 digit number representing the Sorting Code followed by up to 8 numeric digits representing the Customer Information
X'03'	Customer Barcode 2 using Table C (format code = 59)	An 8 digit number representing the Sorting Code followed by up to 5 characters (A-Z, a-z, 0-9, space, #) representing the Customer Information
X'04'	Customer Barcode 2 using proprietary encoding (format code = 59)	An 8 digit number representing the Sorting Code followed by up to 16 numeric digits (0-3) representing the Customer Information. Each of the 16 digits specify one of the 4 types of bar.
X'05'	Customer Barcode 3 using Table N (format code = 62)	An 8 digit number representing the Sorting Code followed by up to 15 numeric digits representing the Customer Information
X'06'	Customer Barcode 3 using Table C (format code = 62)	An 8 digit number representing the Sorting Code followed by up to 10 characters (A-Z, a-z, 0-9, space, #) representing the Customer Information
X'07'	Customer Barcode 3 using proprietary encoding (format code = 62)	An 8 digit number representing the Sorting Code followed by up to 31 numeric digits (0-3) representing the Customer Information. Each of the 31 digits specify one of the 4 types of bar.
X'08'	Reply Paid Barcode (format code = 45)	An 8 digit number representing the Sorting Code

The proprietary encoding allows the customer to specify the types of bars to be printed directly by using 0 for a full bar, 1 for an ascending bar, 2 for a descending bar and 3 for a timing bar. If the customer does not specify enough Customer Information to fill the field, the printer uses a filler bar to extend pad the field out to the correct number of bars.

The printer will encode the data using the proper tables, generate the start and stop bars, generate any needed filler bars, and generate the Reed Solomon ECC bars.

Human-readable interpretation (HRI) can be selected with this bar code type. The format control code, Delivery Point Identifier, and customer information field (if any) appears in the HRI, but the ECC does not.

The proprietary encoding allows the customer to specify the types of bars to be printed directly by using 0 for a full bar, 1 for an ascending bar, 2 for a descending bar, and 3 for a timing bar. If the customer does not specify enough Customer Information to fill the field, the printer uses a filler bar to extend pad the field out to the correct number of bars.

The printer encodes the data using the proper tables, generate the start and stop bars, generate any needed filler bars, and generate the Reed Solomon ECC bars.

Human readable interpretation (HRI) can be selected with this bar code type. The format control code, Delivery Point Identifier, and customer information field (if any) appears in the HRI, but the ECC does not.

QR Code

QR Code 2D Symbol

A two-dimensional matrix barcode symbology defined as an AIM International Technical Standard.

X'02' Present a Model 2 QR Code Bar Code symbol as defined in *AIM International Symbology Specification — QR Code*.

The barcode data is assumed to start with the default character encodation (ECI 000020). This is a single-byte code page representing the JIS8 and Shift JIS character sets; it is equivalent to the ASCII code page 897. To change to a different character encodation within the data, the ECI protocol as defined in the *AIM International "Extended Channel Interpretation (ECI) Assignments"*, must be used.

Since the default character encodation for this bar code is ASCII, the EBCDIC-to-ASCII translation flag can be used in the following manner:

- When all of the input data for the bar code is single–byte EBCDIC using one of the supported code pages (500, 290, or 1027), set the EBCDIC-to-ASCII translation flag to B'1' and select the correct code page in the conversion parameter.
- When all of the input data for the bar code is mixed-byte EBCDIC AFP Line Data using SO and SI controls (SOSI data), set the EBCDIC-to-ASCII translation flag to B'1' and select the desired conversion value in the conversion parameter.

If the bar code data contains more than one character encodation or if the data needs to be encoded within the bar code symbol in a form other than those previously mentioned (such as, in an EBCDIC code page not supported by the EBCDIC-to-ASCII translation flag), the bar code data must begin in the default encodation, the EBCDIC-to-ASCII translation flag must be set to B'0', and the ECI protocol must be used to switch into the other encodation(s).

There must be a quiet zone around the symbol that is at least 4 modules wide on each of the four sides of the symbol.

Note: For more information on QRCODE two-dimensional barcode see "QR Code Special-Function Parameters" on page 579.

Code 93

□39OR93□

Code 93

(encoding 39OR93
yielding a 1.82 inch wide symbol)

A linear barcode symbology similar to Code 39, but more compact than Code 39. Code 93 barcode symbols are made up of a series of characters each of which is represented by 9 modules arranged into 3 bars with their adjacent spaces. The bars and spaces very between 1 module wide and 4 modules wide.

X'00' Present a Code 93 barcode symbol as defined in *AIM International Symbology Specification — Code 93*.

The Code 93 character set contains 47 characters including numeric digits, uppercase alphabetics, four shift characters (a, b, c, and d), and seven special characters. The Code 93 Specification also provides a method of encoding all 128 ASCII characters by using 2 barcode characters for those ASCII characters that are not in the standard Code 93 character set. This is sometimes referred to as "Extended Code 93". In this case, the 2 barcode characters used to specify the "extended character" will be shown in the Human-Readable Interpretation (as a ■ followed by the second character) and the bar code scanner will interpret the two-character combination bar/space pattern appropriately.

The Human-Readable Interpretation of the Start and Stop characters is represented as an open box (□) and the shift characters (a, b, c, and d) are represented as a filled box (■).

There must be a quiet zone preceding and following the symbol that is at least 10 modules wide.

USPS Four-State

USPS Four-State Bar Code

Modifier X'03'

(encoding 01 234 567094 987654321 01234567891)

The USPS Four-State bar code symbology[12] limits the symbol size; therefore BSD element height, height multiplier, and wide-to-narrow ratio fields are not applicable to this symbology and are ignored by BCOCA receivers. The module width field allows for two symbol sizes (small and optimal); the small symbol is approximately 2.575 inches wide and the optimal symbol is approximately 2.9 inches wide.

The input data is all numeric and consists of 5 data fields. The first four fields are fixed length and the 5th field can have one of four lengths; the bar code modifier is used to specify the length of the 5th field. The total length of the input data can be 20, 25, 29, or 31 digits which is defined as follows:

- Barcode ID (2 digits) - assigned by USPS, the 2nd digit must be 0-4. Thus, the valid values are: 00-04, 10-14, 20-24, 30-34, 40-44, 50-54, 60-64, 70-74, 80-84, and 90-94.
- Service Code (3 digits) - assigned by USPS; valid values are 000-999.
- Subscriber ID (6 digits) - assigned by USPS; valid values are 000000-999999.
- Unique ID (9 digits) - assigned by the mailer; valid values are 000000000-999999999.
- Routing ZIP Code (0, 5, 9, or 11 digits) - refer to the modifier for valid values.

USPS Four-State modifier values are defined as follows:

X'00' Present a USPS Four-State bar code symbol with no Delivery Point ZIP Code. The input data for this bar code symbol must be 20 number digits.

X'01' Present a USPS Four-State bar code symbol with a 5-digit Delivery Point ZIP Code. The input data for this bar code symbol must be 25 number digits; the valid values for the Delivery Point ZIP Code are 00000-99999.

X'02' Present a USPS Four-State bar code symbol with a 9-digit Delivery Point ZIP Code. The input data for this bar code symbol must be 29 number digits; the valid values for the Delivery Point ZIP Code are 000000000-999999999.

X'03' Present a USPS Four-State bar code symbol with an 11-digit Delivery Point ZIP Code. The input data for this bar code symbol must be 31 number digits; the valid values for the Delivery Point ZIP Code are 00000000000-99999999999.

Human-Readable Interpretation (HRI) can be printed with a USPS Four-State symbol, but HRI is not used with all types of special services. Refer to *Introducing 4-state Customer Barcode* for a description of when HRI is appropriate.

There must be a quiet zone surrounding the symbol (all four sides) that is at least 0.04 inches above and below and at least 0.125 inches on both sides of the symbol.

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[12] The United States Postal Service (USPS) developed this symbology for use in the USPS mailstream and has named it the OneCode^{SOLUTION} Barcode. The bar code is also known as the “4-state Customer Barcode” and has been abbreviated in several ways: OneCode (4CB), OneCode (4-CB), 4CB, or 4-CB.

Check Digit Calculation Method

Some bar code types and modifiers call for the calculation and presentation of check digits. Check digits are a method of verifying data integrity during the bar coding reading process. Except for UPC Version E, the check digit is always presented in the bar code bar and space patterns, but is not always presented in the HRI. The following table shows the check digit calculation methods for each bar code type and the presence or absence of the check digit in the HRI.

Table 28. Check Digit Calculation Methods For Each Bar Code

Bar Code Type	Modifier	In HRI?	Check Digit Calculation
1 – Code 39 (3-of-9 Code), AIM USS-39	X'02'	Yes	Modulo 43 of the sum of the data characters' numerical values as described in a Code 39 specification. The start and stop codes are not included in the calculation.
2 – MSI (modified Plessey code)	X'02' – X'09'	No	IBM Modulus 10 check digit: 1. Multiply each digit of the original number by a weighting factor of 1 or 2 as follows: multiply the units digit by 2, the tens digit by 1, the hundreds digit by 2, the thousands digit by 1, and so forth. 2. Sum the digits of the products from step 1. This is not the same as summing the values of the products. 3. The check digit is described by the following equation where “sum” is the resulting value of step 2: (10 - (sum modulo 10)) modulo 10
			IBM Modulus 11 check digit: 1. Multiply each digit of the original number by a repeating weighting factor pattern of 2, 3, 4, 5, 6, 7 as follows: multiply the units digit by 2, the tens digit by 3, the hundreds digit by 4, the thousands digit by 5, and so forth. 2. Sum the products from step 1. 3. The check digit depends on the bar code modifier. The check digit as the remainder is described by the following equation where “sum” is the resulting value of step 2: (sum modulo 11) The check digit as 11 minus the remainder is described by the following equation: (11 - (sum modulo 11)) modulo 11

Table 28. Check Digit Calculation Methods For Each Bar Code (continued)

Bar Code Type	Modifier	In HRI?	Check Digit Calculation
			NCR Modulus 11 check digit: 1. Multiply each digit of the original number by a repeating weighting factor pattern of 2, 3, 4, 5, 6, 7, 8, 9 as follows: multiply the units digit by 2, the tens digit by 3, the hundreds digit by 4, the thousands digit by 5, and so forth. 2. Sum the products from step 1. 3. The check digit depends on the bar code modifier. The check digit as the remainder is described by the following equation where "sum" is the resulting value of step 2: (sum modulo 11) The check digit as 11 minus the remainder is described by the following equation: (11 - (sum modulo 11)) modulo 11
3 – UPC/CGPC Version A	X'00'	Yes	UPC/EAN check digit calculation: 1. Multiply each digit of the original number by a weighting factor of 1 or 3 as follows: multiply the units digit by 3, the tens digit by 1, the hundreds digit by 3, the thousands digit by 1, and so forth. 2. Sum the products from step 1. 3. The check digit is described by the following equation where "sum" is the resulting value of step 2: (10 - (sum modulo 10)) modulo 10
5 – UPC/CGPC Version E	X'00'	Yes	See UPC/CGPC Version A
8 – EAN 8 (includes JAN-short)	X'00'	Yes	See UPC/CGPC Version A
9 – EAN 13 (includes JAN-standard)	X'00'	Yes	See UPC/CGPC Version A
10 – Industrial 2-of-5	X'02'	Yes	See UPC/CGPC Version A
11 – Matrix 2-of-5	X'02'	Yes	See UPC/CGPC Version A
12 – Interleaved 2-of-5	X'02'	Yes	See UPC/CGPC Version A

Table 28. Check Digit Calculation Methods For Each Bar Code (continued)

Bar Code Type	**Modifier**	**In HRI?**	**Check Digit Calculation**
13 – Codabar, 2-of-7, AIM USS-Codabar	X'02'	No	Codabar check digit calculation: 1. Sum of the data characters' numerical values as described in a Codabar specification. All data characters are used, including the start and stop characters. 2. The check digit is described by the following equation where “sum” is the resulting value of step 1: (16 - (sum modulo 16)) modulo 16
17 – Code 128, AIM USS-128	X'02'	No	Code 128 check digit calculation: 1. Going left to right starting at the start character, sum the value of the start character and the weighted values of data and special characters. The weights are 1 for the first data or special character, 2 for the second, 3 for the third, and so forth. The stop character is not included in the calculation. 2. The check digit is modulo 103 of the resulting value of step 1.
24 – POSTNET	X'00' – X'04'	NA	The POSTNET check digit is (10 - (sum modulo 10)) modulo 10, where “sum” is the sum of the ZIP code data.
26 – RM4SCC	X'00'	NA	The RM4SCC checksum digit is calculated using an algorithm that weights each of the 4 bars within a character in relation to its position within the character.
	X'01'	NA	None.

Table 28. Check Digit Calculation Methods For Each Bar Code (continued)

Bar Code Type	Modifier	In HRI?	Check Digit Calculation
27 – Japan Postal Bar Code JPOSTAL	X'00'	N/A	The Japan Postal Bar Code check digit calculation: Convert each character in the bar code data into decimal numbers. Numeric characters are converted to decimal; each hyphen character is converted to the number 10, each alphabetic character is converted to two numbers according to the symbology definition. For example, A becomes “11 and 0”, B becomes “11 and 1”,..., J becomes “11 and 9”, K becomes “12 and 0”, L becomes “12 and 1”, ..., T becomes “12 and 9”, U becomes “13 and 0”, V becomes “13 and 1”, ..., and Z becomes “13 and 5”. Sum the resulting decimal numbers and calculate the remainder modulo 19. The check digit is 19 minus the remainder.
	X'01'	N/A	None
28 – DataMatrix (2DMATRIX)	X'00'	N/A	The DataMatrix symbology uses a Reed-Solomon error checking and correcting algorithm.
29 – MaxiCode 2DMAXI	X'00'	N/A	The MaxiCode symbology uses a Reed-Solomon error checking and correcting algorithm.
30 – PDF417	X'00'–X'01'	N/A	The PDF417 symbology uses a Reed-Solomon error checking and correcting algorithm.
31 – Australia Post Bar Code APOSTAL	X'01' – X'08'	No	The Australian Post Bar Code uses a Reed Solomon error correction code based on Galois Field 64.
32 — QR Code	X'02'	NA	The QR Code symbology uses a Reed-Solomon Error Checking and Correcting (ECC) algorithm.
33 — Code 93	X'00'	No	Both check digits (C and K) are calculated as Modulo 47 of the sum of the products of the data-character numerical values as described in the Code 93 specification and a weighting sequence. The start and stop codes are not included in the calculation.
34 — USPS Four-State	X'00'–X'03'	No	There is no check digit, but error detection and correction is added as part of the encoding process. Refer to: “Specifications for the Four-State Barcode”.

Barcode Exception Conditions

This section lists the BCOCA exception conditions required to be detected by the bar code object processor when processing the bar code data structures and specifies the standard actions to be taken.

Specification-Check Exceptions

A specification-check exception indicates that the bar code object processor has received a bar code request with invalid or unsupported data parameters or values.

Exception	**Description**
EC-0300	The bar code type specified in the BSD data structure is invalid or unsupported. **Standard Action:** Terminate bar code object processing.
EC-0400	A font local ID specified in the BSD data structure is unsupported or not available. For those symbologies that require a specific type style or code page for HRI, the BCOCA receiver cannot determine the type style or code page of the specified font. **Standard Action:** If the requested font is not available, a font substitution can be made preserving as many characteristics as possible of the originally requested font while still preserving the original code page. Otherwise, terminate bar code object processing. Some bar code symbologies specify a set of type styles to be used for HRI data. Font substitution for HRI data must follow the bar code symbology specification being used.
EC-0500	The color specified in the BSD data structure is invalid or unsupported. **Standard Action:** The device default color is used.
EC-0505	The unit base specified in the BSD data structure is invalid or unsupported. **Standard Action:** Terminate bar code object processing.
EC-0600	The module width specified in the BSD data structure is invalid or unsupported. **Standard Action:** The bar code object processor uses the closest smaller width. If the smaller value is less than the smallest supported width or zero, the bar code object processor uses the smallest supported value.
EC-0605	The units per unit base specified in the BSD data structure is invalid or unsupported.

	Standard Action: Terminate bar code object processing.
EC-0700	The element height specified in the BSD data structure is invalid or unsupported. **Standard Action:** The bar code object processor uses the closest smaller height. If the smaller value is less than the smallest supported element height or zero, the bar code object processor uses the smallest supported value.
EC-0705	The presentation space extents specified in the BSD data structure are invalid or unsupported. **Standard Action:** Terminate bar code object processing.
EC-0800	The height multiplier specified in the BSD data structure is invalid. **Standard Action:** The bar code object processor uses X'01'.
EC-0900	The wide-to-narrow ratio specified in the BSD data structure is invalid or unsupported. **Standard Action:** The bar code object processor uses the default wide-to-narrow ratio. The default ratio is in the range of 2.25 through 3.00 to 1. The MSI bar code, however, uses a default wide-to-narrow ratio of 2.00 to 1.
EC-0A00	The bar code origin (Xoffset value or Yoffset value) given in the BSA data structure is invalid or unsupported. **Standard Action:** Terminate bar code object processing.
EC-0B00	The bar code modifier in the BSD data structure is invalid or unsupported for the bar code type specified in the same BSD. **Standard Action:** Terminate bar code object processing.
EC-0C00	The length of the variable data specified in the BSA data structure plus any bar code object processor generated check digits is invalid or unsupported. **Standard Action:** Terminate bar code object processing.
EC-0E00	The first check-digit calculation resulted in a value of 10; this is defined as an exception condition in some of the modifier options for MSI bar codes in the BSD data structure. **Standard Action:** Terminate bar code object processing.
EC-0F00	Either the matrix row size value or the number of rows value specified in the BSA data structure is

	unsupported. Both of these values must be within the range of supported sizes for the symbology. **Standard Action:** Use X'0000' for the unsupported value so that an appropriate size is used based on the amount of symbol data.
EC-0F01	An invalid structured append sequence indicator was specified in the BSA data structure. For a Data Matrix symbol, the sequence indicator must be between 1 and 16 inclusive. For a MaxiCode symbol, the sequence indicator must be between 1 and 8 inclusive. **Standard Action:** Present the bar code symbol without structured append information.
EC-0F02	A structured append sequence indicator specified in the BSA data structure is larger than the total number of structured append symbols. **Standard Action:** Present the bar code symbol without structured append information.
EC-0F03	Mismatched structured append information was specified in the BSA data structure. One of the sequence-indicator and total-number-of-symbols parameters was X'00', but the other was not X''. **Standard Action:** Present the bar code symbol without structured append information.
EC-0F04	An invalid number of structured append symbols was specified in the BSA data structure. For a Data Matrix symbol, the total number of symbols must be between 2 and 16 inclusive. For a MaxiCode symbol, the total number of symbols must be between 2 and 8 inclusive. **Standard Action:** Present the bar code symbol without structured append information.
EC-0F05	For a MaxiCode symbol, the symbol mode value specified in the BSA data structure is invalid. **Standard Action:** Terminate bar code object processing.
EC-0F06	For a PDF417 symbol, the number of data symbol characters per row value specified in the BSA data structure is invalid. **Standard Action:** Terminate bar code object processing.
EC-0F07	For a PDF417 symbol, the desired number of rows value specified in the BSA data structure is invalid. This exception condition can also occur when the number of rows times the number of data symbol characters per row is greater than 928. **Standard Action:** Proceed as if X'FF' was specified.

EC-0F08	For a PDF417 symbol, too much data was specified in the BSA data structure. **Standard Action:** Terminate bar code object processing.
EC-0F09	For a PDF417 symbol, the security level value specified in the BSA data structure is invalid. **Standard Action:** Proceed as if security level 8 was specified.
EC-0F0A	An incompatible combination of Data Matrix parameters was specified in the BSA data structure. The following conditions can cause this exception condition: • A structured append was specified (byte 10 not X'00'), but either the reader programming flag was set to B'1' or a hdr/trl macro was specified. • The UCC/EAN FNC1 flag was set to B'1', but either the industry FNC1 flag was set to B'1', the reader programming flag was set to B'1', or a hdr/trl macro was specified. • The industry FNC1 flag was set to B'1', but either the UCC/EAN FNC1 flag was set to B'1', the reader programming flag was set to B'1', or a hdr/trl macro was specified. • The reader programming flag was set to B'1', but either a structured append was specified, one of the FNC1 flags was set to B'1', or a hdr/trl macro was specified. • A hdr/trl macro was specified, but either a structured append was specified, one of the FNC1 flags was set to B'1', or the reader programming flag was set to B'1'. **Standard Action:** Terminate bar code object processing.
EC-0F0B	An invalid structured append file identification value was specified in the BSA data structure. Each byte of the 2-byte file identification value must be in the range X'01'—X'FE'. **Standard Action:** Present the bar code symbol without structured append information.
EC-0F0C	A Macro PDF417 Control Block length value specified in the BSA data structure is invalid. **Standard Action:** Terminate bar code object processing.
EC-0F0D	Data within a Macro PDF417 Control Block specified in the BSA data structure is invalid. **Standard Action:** Present the bar code symbol without a Macro PDF417 Control Block.
EC-0F0E	For a QR Code symbol, an invalid EBCDIC-code page value was specified in the BSA data structure.

	Standard Action: Terminate the barcode object processing.
EC-0F0F	For a QR Code symbol, an invalid version value was specified in the BSA data structure. **Standard Action:** Proceed as if X'00' had been specified.
EC-0F10	For a QR Code symbol, an invalid error-correction level value was specified in the BSA data structure. **Standard Action:** Proceed as if X'03' had been specified.
EC-0F11	For a QR Code symbol, an invalid combination of special-function flags was specified in the BSA data structure. Only one of the FNC1 flags can be B'1'. **Standard Action:** Terminate the barcode object processing.
EC-0F12	For a QR Code symbol, an invalid application-indicator value was specified in the BSA data structure. **Standard Action:** Present the barcode symbol without structured append information.
EC-1000	The human-readable interpretation location specified in the the BSA data structure is invalid. **Standard Action:** Terminate bar code object processing.
EC-1100	A portion of the bar code, including the bar and space patterns and the HRI, extends outside of either: • The bar code presentation space • The intersection of the mapped bar code presentation space and the controlling environment object area • The maximum presentation area. **Standard Action:** Terminate bar code object processing. All bar code symbols must be presented in their entirety. Whenever a partial bar code pattern is presented, for whatever reason, it is obscured to make it unscannable.
EC-1200	Invalid data was encountered in a UCC/EAN 128 symbol; one or more of the following conditions was encountered: • FNC1 is not the first data character • Invalid application identifier (ai) value encountered • Data for an ai doesn't match the ai definition • Insufficient (or no) data following an ai • Too much data for an ai • Invalid use of FNC1 character

Standard Action: Terminate bar code object processing.

Data-Check Exceptions

A data-check exception indicates that the bar code object processor has detected an undefined character.

Exception	Description
EC-2100	An invalid or undefined character, according to the rules of the symbology specification, has been detected in the bar code data. **Standard Action:** End bar code object processing.

Data Matrix Special-Function Parameters

Offset	Type	Name	Range	Meaning	BCD1 Range
5	BITS			Control flags	
bit 0		EBCDIC	 B'0' B'1'	EBCDIC-to-ASCII translation: Do not translate Convert data from EBCDIC to ASCII	Not supported in BCD1
bit 1		Escape sequence handling	B'0' B'1'	Escape-sequence handling: Process escape sequences Ignore all escape sequences	Not supported in BCD1
bits 2—7			B'000000'	Reserved	
6–7	UBIN	Desired row size	X'0000' X'0001'—X'FFFF'	No size specified Matrix row size as allowed by symbology; see field description	Not supported in BCD1
8–9	UBIN	Desired number of rows	X'0000' X'0001'—X'FFFF'	No size specified Number of rows as allowed by symbology; see field description	Not supported in BCD1
10	UBIN	Sequence indicator	X'00'—X'10'	Structured append sequence indicator	Not supported in BCD1
11	UBIN	Total symbols	X'00' or X'02'—X'10'	Total number of structured-append symbols	Not supported in BCD1
12	UBIN	File ID 1st byte	X'01'—X'FE'	High-order byte of a 2-byte unique file identification for a set of structured-append symbols	Not supported in BCD1
13	UBIN	File ID 2nd byte	X'01'—X'FE'	Low-order byte of a 2-byte unique file identification for a set of structured-append symbols	Not supported in BCD1
14	BITS			Special-function flags	
bit 0		UCC/ EAN FNC1	B'0' B'1'	Alternate data type identifier: User-defined symbol Symbol conforms to UCC/EAN standards	Not supported in BCD1
bit 1		Industry FNC1	B'0' B'1'	Alternate data type identifier: User-defined symbol Symbol conforms to industry standards	Not supported in BCD1
bit 2		Reader programming	B'0' B'1'	Reader programming symbol: Symbol encodes a data symbol Symbol encodes a message used to program the reader system	Not supported in BCD1

Offset	Type	Name	Range	Meaning	BCD1 Range
bit 3–4		Hdr/Trl Macro	 B'00' B'01' B'10' B'11'	Header and trailer instructions to the bar code reader: No header or trailer Use the 05 Macro header/trailer Use the 06 Macro header/trailer No header or trailer	Not supported in BCD1
bit 5—7			B'000'	Reserved	

A desired symbol size can be specified in bytes 6–9, but the actual size of the symbol depends on the amount of data to be encoded. If not enough data is supplied, the symbol is padded with null data to reach the requested symbol size. If too much data is supplied for the requested symbol size, the symbol is bigger than requested, but the aspect ratio is maintained as closely as possible.

Byte 5 Control flags

These flags control how the bar code data (bytes n+1 to end) is processed by the BCOCA receiver.

Bit 0 EBCDIC-to-ASCII translation

If this flag is B'0', the data is assumed to begin in the default character encodation and no translation is done.

If this flag is B'1', the BCOCA receiver converts each byte of the bar code data from EBCDIC code page 500 into ASCII code page 819 before this data is used to build the bar code symbol.

Bit 1 Escape-sequence handling

If this flag is B'0', each X'5C' (backslash) within the bar code data is treated as an escape character according to the Data Matrix symbology specification.

If this flag is B'1', each X'5C' within the bar code data is treated as a normal data character and therefore all escape sequences are ignored. In this case, no ECI code page switching can occur within the data.

Note: If the EBCDIC-to-ASCII translation flag is also set to B'1', all EBCDIC backslash characters (X'E0') are first converted into X'5C' before the escape-sequence handling flag is applied.

Bits 2—7
Reserved

Bytes 6—7
Desired row size

For a Data Matrix symbol, this parameter specifies the desired number of modules in each row including the finder pattern. There must be an even number of modules per row and an even number of rows. There are square symbols with sizes from 10x10 to 144x144, and rectangular symbols with sizes from 8x18 to 16x48 not including quiet zones. The following table lists the complete set of supported sizes. Exception condition EC-0F00 exists EC-0F00 if an unsupported size value is specified.

If X'0000' is specified for this parameter, an appropriate row size is used based on the amount of symbol data.

Table 29. Supported Sizes for a Data Matrix symbol

Square Symbols				Rectangular Symbols			
Symbol Size		**Data Region**		**Symbol Size**		**Data Region**	
Number of rows	**Row size**	**Size**	**Number**	**Number of rows**	**Row size**	**Size**	**Number**
10	10	8x8	1	8	18	6x6	1
12	12	10x10	1	8	32	6x14	2
14	14	12x12	1	12	26	10x24	1
16	16	14x14	1	12	36	10x16	2
18	18	16x16	1	16	36	14x16	2
20	20	18x18	1	16	48	14x22	2
22	22	20x20	1				
24	24	22x22	1				
26	26	24x24	1				
32	32	14x1`4	4				
36	36	16x16	4				
40	40	18x18	4				
44	44	20x20	4				
48	48	22x22	4				
52	52	24x24	4				
64	64	14x14	16				
72	72	16x16	16				
80	80	18x18	16				
88	88	20x20	16				
96	96	22x22	16				
104	104	24x24	16				
120	120	18x18	36				
132	132	20x20	36				
144	144	24x24	36				

Bytes 8–9

Desired number of rows

For a Data Matrix symbol, this parameter specifies the desired number of rows including the finder pattern. Exception condition EC-0F00 exists if an unsupported size value is specified.

If X'0000' is specified for this parameter, an appropriate number of rows are used based on the amount of symbol data.

Byte 10

Structured append sequence indicator

Multiple data matrix bar code symbols (called structured appends) can be logically linked together to encode large amounts of data. The logically linked symbols can be presented on the same or on different physical media, and are logically recombined after they are scanned. From 2 to 16 Data Matrix symbols can be linked. This parameter specifies where this symbol is logically linked (1—16) in a sequence of symbols.

If X'00' is specified for this parameter, this symbol is not part of a structured append. Exception condition EC-0F01 exists if an invalid sequence indicator value is specified. Exception condition EC-0F02 exists if the sequence indicator is larger than the total number of symbols (byte 11).

If this field is not X'00', the reader programming flag must be B'0' and the hdr/trl macro flags must be either B'00' or B'11'. Exception condition EC-0F0A exists if an incompatible combination of these parameters is specified.

Byte 11

Total symbols in a structured append

This parameter specifies the total number of symbols (2—16) that is logically linked in a sequence of symbols.

If X'00' is specified for this parameter, this symbol is not part of a structured append. If this symbol is not part of a structured append, both bytes 10 and 11 must be 00 or exception condition EC-0F03 exists.

Exception condition EC-0F04 exists if an invalid number of symbols is specified.

Byte 12

High-order byte of structured append file identification

This parameter specifies the high-order byte of a 2-byte unique file identification for a set of structured-append symbols, which helps ensure that the symbols from two different structured appends are not linked together. The low-order byte of the 2-byte field is specified in byte 13. Each of the two bytes can contain a value in the range X'01'—X'FE'.

This parameter is ignored if this symbol is not part of a structured append.

If this symbol is part of a structured append, but byte 12 contains an invalid value (X'00' or X'FF'), exception condition EC-0F0B exists.

Byte 13

Low-order byte of structured append file identification

This parameter specifies the low-order byte of a 2-byte unique file identification for a set of structured-append symbols. The high-order byte of the 2-byte field is specified in byte 12. Each of the two bytes can contain a value in the range X'01'—X'FE'.

This parameter is ignored if this symbol is not part of a structured append.

If this symbol is part of a structured append, but byte 13 contains an invalid value (X'00' or X'FF'), exception condition EC-0F0B exists.

Byte 14

Special-function flags

These flags specify special functions that can be used with a Data Matrix symbol.

Bit 0 UCC/EAN FNC1 alternate data type identifier

If this flag is B'1', an FNC1 shall be added in the first data position (or fifth position of a structured append symbol) to indicate that this symbol conforms to the UCC/EAN application identifier standard format. In this case, the industry FNC1 flag must be B'0', the reader programming flag must be B'0', and the hdr/trl macro must be B'00' or B'11'. Exception condition EC-0F0A exists if an incompatible combination of these parameters is specified.

Bit 1 Industry FNC1 alternate data type identifier

If this flag is B'1', an FNC1 shall be added in the second data position (or sixth position of a structured append symbol) to indicate that this symbol conforms to a particular industry standard format. In this case, the UCC/EAN FNC1 flag must be B'0', the reader programming flag must be B'0', and the hdr/trl macro must be B'00' or B'11'. Exception condition EC-0F0A exists if an incompatible combination of these parameters is specified.

Bit 2 Reader programming

If this flag is B'1', this symbol encodes a message used to program the reader system. In this case, the structured append sequence indicator must be X'00', the UCC/EAN FNC1 and industry FNC1 flags must both be B'0', and the hdr/trl macro flags must be either B'00' or B'11'. Exception condition EC-0F0A exists if an incompatible combination of these parameters is specified.

Bits 3–4

Header and trailer instructions to the bar code reader

This field provides a means of instructing the bar code reader to insert an industry specific header and trailer around the symbol data.

If this field is B'00' or B'11', no header or trailer is inserted. If this field is B'01', the bar code symbol contains a 05 Macro codeword. If this field is B'10', the bar code symbol contains a 06 Macro codeword.

If these flags are B'01' or B'10', the structured append sequence indicator must be X'00', the UCC/EAN FNC1 and industry FNC1 flags must both be B'0', and the reader programming flag must be B'0'. Exception condition EC-0F0A exists if an incompatible combination of these parameters is specified.

Bits 5—7

Reserved

MaxiCode Special-Function Parameters

Offset	Type	Name	Range	Meaning	BCD1 Range
5	BITS			Control flags	
bit 0		EBCDIC	B'0' B'1'	EBCDIC-to-ASCII translation: Do not translate Convert data from EBCDIC to ASCII	Not supported in BCD1
bit 1		Escape sequence handling	B'0' B'1'	Escape-sequence handling: Process escape sequences Ignore all escape sequences	Not supported in BCD1
bits 2—7			B'000000'	Reserved	

Offset	Type	Name	Range	Meaning	BCD1 Range
6	CODE	Symbol Mode	X'02'	Mode 2	Not supported in BCD1
			X'03'	Mode 3	
			X'04'	Mode 4	
			X'05'	Mode 5	
			X'06'	Mode 6	
7	UBIN	Sequence indicator	X'00'—X'08'	Structured append sequence indicator	Not supported in BCD1
8	UBIN	Total symbols	X'00' or X'02'—X'08'	Total number of structured-append symbols	Not supported in BCD1
9	BITS			Special-function flags	
bit 0		Zipper	B'0'	No zipper pattern	Not supported in BCD1
			B'1'	Vertical zipper pattern on right	
bit 1—7			B'0000000'	Reserved	

Byte 5 Control flags

These flags control how the bar code data (bytes n+1 to end) is processed by the BCOCA receiver.

Bit 0 EBCDIC-to-ASCII translation

If this flag is B'0', the data is assumed to begin in the default character encodation and no translation is done.

If this flag is B'1', the BCOCA receiver converts each byte of the bar code data from EBCDIC code page 500 into ASCII code page 819 before this data is used to build the bar code symbol.

Bit 1 Escape-sequence handling

If this flag is B'0', each X'5C' (backslash) within the bar code data is treated as an escape character according to the MaxiCode symbology specification.

If this flag is B'1', each X'5C' within the bar code data is treated as a normal data character and therefore all escape sequences are ignored. In this case, no ECI code page switching can occur within the data.

Note: If the EBCDIC-to-ASCII translation flag is also set to B'1', all EBCDIC backslash characters (X'E0') are first converted into X'5C' before the escape-sequence handling flag is applied.

Bits 2—7
Reserved

Byte 6 Symbol mode

Mode 2
Structured Carrier Message - numeric postal code

This mode is designed for use in the transport industry, encoding the postal code, country code, and service class with the postal code being numeric. The bar code data should be structured as described in B.2.1 and B.3.1 of the *AIM International Symbology Specification - MaxiCode*. The postal code, country code, and service class are placed in the primary message portion of the MaxiCode symbol and the rest of the bar code data is placed in the secondary message portion of the MaxiCode symbol. The first part of the bar code data includes the postal code, country code and service class, in that order, separated by the [GS] character (X'1D'). This information may be preceded by the character sequence "[)>RS01GS*yy*", where RS and GS are single characters and *yy* are two decimal digits representing a year. This character sequence represented in hex bytes is X'5B293E1E30311Dxxxx', where each *xx* is a value from X'30' to X'39'. This sequence indicates that the message conforms to particular open system standards. This first portion of the bar code data must be encoded using the MaxiCode default character set (ECI 000003 = ISO 8859-1). This first portion of the bar code data must not contain the backslash escape character to change the ECI character set. The postal code must be one to nine decimal digits with each digit represented by the byte values from X'30' to X'39'. The country code must be one to three decimal digits with each digit being a byte value from X'30' to X'39'. The service code must also be one to three decimal digits, again with each digit being a byte value from X'30' to X'39'. The primary message portion of the MaxiCode symbol uses Enhanced Error Correction (EEC) and the secondary message portion of the MaxiCode symbol uses Standard Error Correction (SEC).

When the postal code portion of the Structured Carrier Message is numeric, mode 2 should be used.

Mode 3

Structured Carrier Message - alphanumeric postal code

This mode is designed for use in the transport industry, encoding the postal code, country code, and service class with the postal code being alphanumeric. The bar code data should be structured as described in B.2.1 and B.3.1 of the *AIM International Symbology Specification - MaxiCode*. The postal code, country code, and service class are placed in the primary message portion of the MaxiCode symbol and the rest of the bar code data is placed in the secondary message portion of the MaxiCode symbol. The first part of the bar code data includes the postal code, country code and service class, in that order, separated by the [GS] character (X'1D'). This information may be preceded by the character sequence "[)>RS01GS*yy*", where RS and GS are single characters and *yy* are two decimal digits representing a year. This character sequence represented in hex bytes is X'5B293E1E30311Dxxxx', where each *xx* is a value from X'30' to X'39'. This sequence indicates that the message conforms to particular open system standards. This first portion of the bar code data must be encoded using the MaxiCode default character set (ECI 000003 = ISO 8859-1). This first portion of the bar code data must not contain the backslash escape character to change the ECI character set. The postal code must be one to six alphanumeric characters with each character being one of the printable characters in MaxiCode Code Set A. Postal codes less than 6 characters are padded with trailing spaces; postal codes longer than 6 characters are truncated. These characters include the letters A to Z (X'41' to X'5A'), the space character (X'20'), the special characters (X'22' to X'2F'), the decimal digits (X'30' to X'39'), and the colon (X'3A'). The country code must be one to three decimal digits with each digit being a byte value from X'30' to X'39'. The service code must also be one to three decimal digits, again with each digit being a byte value from X'30' to X'39'. The primary message portion of the MaxiCode symbol uses Enhanced Error Correction (EEC) and the secondary message portion of the MaxiCode symbol uses Standard Error Correction (SEC).

When the postal code portion of the Structured Carrier Message is alphanumeric, mode 3 should be used.

Mode 4

Standard Symbol

The symbol employs EEC for the Primary Message and SEC for the Secondary Message. The first nine codewords are placed in the Primary Message and the rest of the codewords are placed in the Secondary Message. This mode provides for a total of 93 codewords for data. If the bar code data consists of only characters from MaxiCode Code Set A, the number of codewords matches the number of bar code data characters. However, if the bar code data contains other characters, the number of codewords is greater than the number of bar code data characters due to the overhead of switching to and from the different code sets. The Code Set A consists of the byte values X'0D', X'1C' to X'1E', X'20', X'22' to X'3A', and X'41' to X'5A'.

Mode 5

Full ECC Symbol

The symbol employs EEC for the Primary Message and EEC for the Secondary Message. The first nine codewords are placed in the Primary Message and the rest of the codewords are placed in the Secondary Message. This mode provides for a total of 77 codewords for data. If the bar code data consists of only characters from MaxiCode Code Set A, the number of codewords matches the number of bar code data characters. However, if the bar code data contains other characters, the number of codewords is greater than the number of bar code data characters due to the overhead of switching to and from the different code sets. The Code Set A consists of the byte values X'0D', X'1C' to X'1E', X'20', X'22' to X'3A', and X'41' to X'5A'.

Mode 6

Reader Program, SEC

The symbol employs EEC for the Primary Message and SEC for the Secondary Message. The data in the symbol is used to program the bar code reader system. The first nine codewords are placed in the Primary Message and the rest of the codewords are placed in the Secondary Message. This mode provides for a total of 93 codewords for data. If the bar code data consists of only characters from MaxiCode Code Set A, the number of codewords matches the number of bar code data characters. However, if the bar code data contains other characters, the number of codewords is greater than the number of bar code data characters due to the overhead of switching to and from the different code sets. The Code Set A consists of the byte values X'0D', X'1C' to X'1E', X'20', X'22' to X'3A', and X'41' to X'5A'.

Exception condition EC-0F05 exists if an invalid symbol-mode value is specified.

Byte 7 Structured append sequence indicator

Multiple MaxiCode bar code symbols (called structured appends) can be logically linked together to encode large amounts of data. The logically linked symbols can be presented on the same or on different physical media, and are logically recombined after they are scanned. From 2 to 8 MaxiCode symbols can be linked. This parameter specifies where this particular symbol is logically linked (1&–8) in a sequence of symbols.

If X'00' is specified for this parameter, this symbol is not part of a structured append. Exception condition EC-0F01 exists if an invalid sequence indicator value is specified. Exception condition EC-0F02 exists if the sequence indicator is larger than the total number of symbols (byte 8).

Byte 8 Total symbols in a structured append

This parameter specifies the total number of symbols (2—8) that is logically linked in a sequence of symbols.

If X'00' is specified for this parameter, this symbol is not part of a structured append. If this symbol is not part of a structured append, both bytes 6 and 7 must be X'00', or exception condition EC-0F03 exists.

Exception condition EC-0F04 exists if an invalid number of symbols is specified.

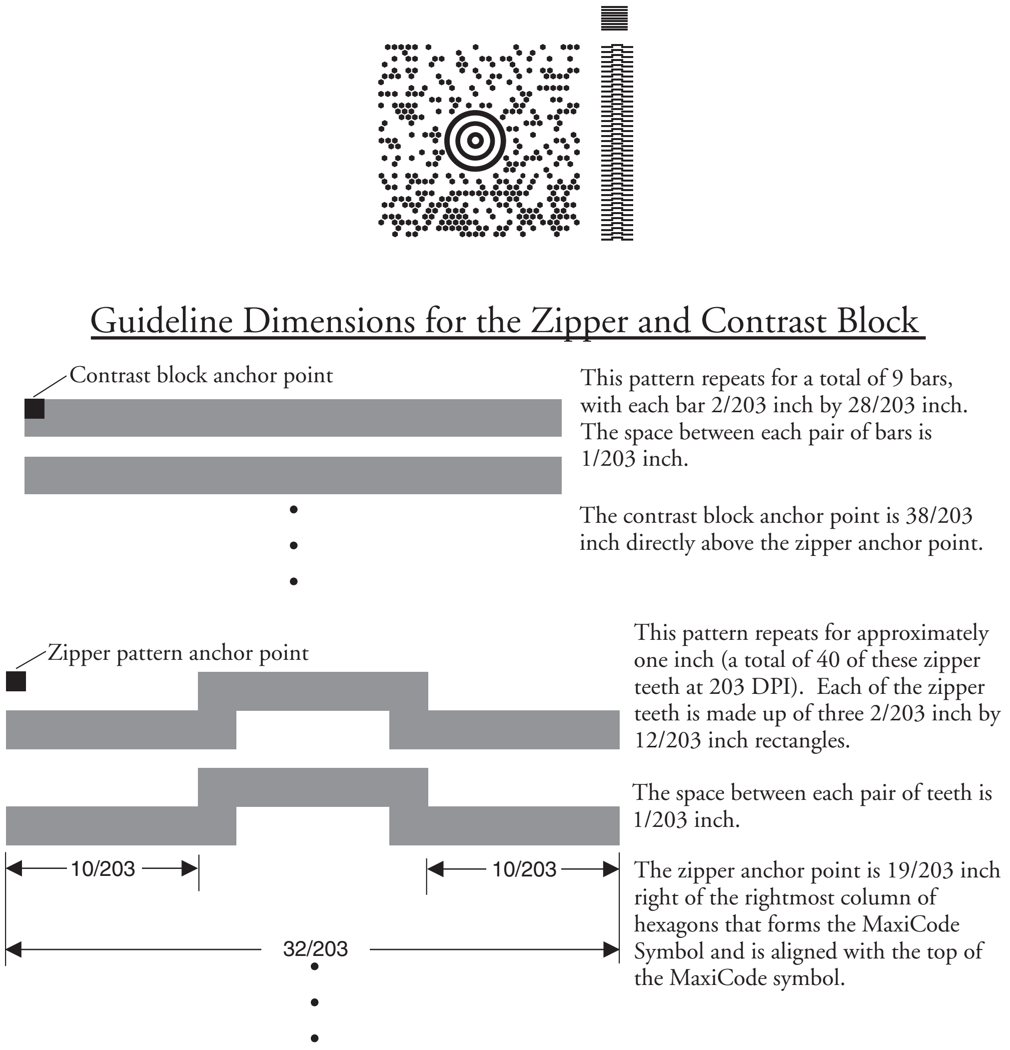
Byte 9 Special-function flags

These flags specify special functions that can be used with a MaxiCode symbol.

Bit 0 Zipper pattern

If this flag is B'1', a vertical zipper-like test pattern and a contrast block is printed to the right of the symbol. The zipper provides a quick visual check for printing distortions. If the symbol presentation space is rotated, the zipper and contrast block are rotated along with the symbol.

To maintain consistency among printers, the zipper pattern and contrast block should approximate the guideline dimensions shown in Figure 128 on page 573. The zipper pattern and contrast block is made up of several filled rectangles that should be created such that each rectangle is as close to the specified dimensions as possible for the particular printer pel resolution, then the pattern is repeated to yield an evenly spaced zipper pattern and contrast block.



This pattern repeats for a total of 9 bars, with each bar 2/203 inch by 28/203 inch. The space between each pair of bars is 1/203 inch.

The contrast block anchor point is 38/203 inch directly above the zipper anchor point.

This pattern repeats for approximately one inch (a total of 40 of these zipper teeth at 203 DPI). Each of the zipper teeth is made up of three 2/203 inch by 12/203 inch rectangles.

The space between each pair of teeth is 1/203 inch.

The zipper anchor point is 19/203 inch right of the rightmost column of hexagons that forms the MaxiCode Symbol and is aligned with the top of the MaxiCode symbol.

Figure 128. Example of a MaxiCode Bar Code Symbol with Zipper and Contrast Block

Bits 1—7
Reserved

PDF417 Special-Function Parameters

Offset	Type	Name	Range	Meaning	BCD1 Range
5	BITS			Control flags	
bit 0		EBCDIC	 B'0' B'1'	EBCDIC-to-ASCII translation: Do not translate Convert data from EBCDIC to ASCII	Not supported in BCD1
bit 1		Escape sequence handling	B'0' B'1'	Escape-sequence handling: Process escape sequences Ignore all escape sequences	Not supported in BCD1
bits 2—7			B'000000'	Reserved	

Offset	Type	Name	Range	Meaning	BCD1 Range
6	UBIN	Data symbols	X'01'—X'1E'	Number of data symbol characters per row	Not supported in BCD1
7	UBIN	Rows	X'03'—X'5A' X'FF'	Desired number of rows Minimum necessary rows	Not supported in BCD1
8	UBIN	Security	X'00'—X'08'	Security level	Not supported in BCD1
9–10	UBIN	Macro length	X'0000'—X'7FED'	Length of Macro PDF417 Control Block that follows	Not supported in BCD1
11–*n*	UBIN	Macro data	Any value	Data for Macro PDF417 Control Block	Not supported in BCD1

Byte 5 Control flags

These flags control how the bar code data is processed by the BCOCA receiver.

Bit 0 EBCDIC-to-ASCII translation (for bytes 11 to end)

If this flag is B'0', the data is assumed to begin in the default character encodation and no translation is done.

If this flag is B'1', the BCOCA receiver converts each byte of the bar code data (bytes n+1 to end) and each byte of the Macro PDF417 Control Block data (bytes 11—*n*) from a subset of EBCDIC code page 500 into the default character encodation (GLI 0) before this data is used to build the bar code symbol. This translation covers 181 code points which includes alphanumerics and many symbols; the 75 code points that are not covered by the translation do not occur in EBCDIC and are mapped to X'7F' (127). Refer to Figure 129 on page 575 for a picture showing the 181 EBCDIC code points that can be translated.

The EBCDIC-to-ASCII translation flag should not be used if any of the 75 code points that have no EBCDIC equivalent are needed for the bar code data or for the Macro PDF417 Control Block data.

Table 5 in the *Uniform Symbology Specification – PDF417* shows the full set of GLI 0 code points; from this set, the 75 code points that have no EBCDIC equivalent are as follows:

`158, 159, 169, 176–224, 226–229, 231–240, 242–245, 247, 249, 251–252, and 254.`

The 75 EBCDIC code points that are not covered by the translation and are thus mapped into X'7F' are as follows:

X'04', X'06', X'08'—X'0A', X'14'—,X'15', X'17',
X'1A'—X'1B', X'20'—X'24', X'28'—X'2C', X'30'—X'31',

X'33'—X'36', X'38'—X'3B', X'3E' X'46', X'62'
X'64'—X'66', X'6A', X'70', X'72'—X'78', X'80',
X'8C'—X'8E', X'9D' X'9F', X'AC'—X'AF', X'B4'—X'B6',
X'B9', X'BC'—,X'BF', X'CA', X'CF', X'DA', X'EB',
X'ED'—X'EF', X'FA'—X'FB', X'FD'—X'FF'

Hex Digits 1st → 2nd ↓	0-	1-	2-	3-	4-	5-	6-	7-	8-	9-	A-	B-	C-	D-	E-	F-
-0	NUL SE010000	DLE SE170000			(SP) SP010000	& SM030000	_ SP100000			° SM190000	µ SM170000	¢ SC040000	{ SM110000	} SM140000	\\ SM070000	0 ND100000
-1	SOH SE020000	DC1 SE180000			(RSP) SP300000	é LE110000	/ SP120000	É LE120000	a LA010000	j LJ010000	~ SD190000	£ SC020000	A LA020000	J LJ020000	÷ SA060000	1 ND010000
-2	STX SE030000	DC2 SE190000		SYN SE230000	â LA150000	ê LE150000			b LB010000	k LK010000	s LS010000	¥ SC050000	B LB020000	K LK020000	S LS020000	2 ND020000
-3	ETX SE040000	DC3 SE200000			ä LA170000	ë LE170000	Ä LA180000		c LC010000	l LL010000	t LT010000	· SD630000	C LC020000	L LL020000	T LT020000	3 ND030000
-4					à LA130000	è LE130000			d LD010000	m LM010000	u LU010000		D LD020000	M LM020000	U LU020000	4 ND040000
-5	HT SE100000		LF SE110000		á LA110000	í LI110000			e LE010000	n LN010000	v LV010000		E LE020000	N LN020000	V LV020000	5 ND050000
-6		BS SE090000	ETB SE240000			î LI150000			f LF010000	o LO010000	w LW010000		F LF020000	O LO020000	W LW020000	6 ND060000
-7	DEL SE330000		ESC SE280000	EOT SE050000	å LA270000	ï LI170000	Å LA280000		g LG010000	p LP010000	x LX010000	¼ NF040000	G LG020000	P LP020000	X LX020000	7 ND070000
-8		CAN SE250000			ç LC410000	ì LI130000	Ç LC420000		h LH010000	q LQ010000	y LY010000	½ NF010000	H LH020000	Q LQ020000	Y LY020000	8 ND080000
-9		EM SE260000			ñ LN190000	ß LS610000	Ñ Ln200000	` SD130000	i LI010000	r LR010000	z LZ010000		I LI020000	R LR020000	Z LZ020000	9 ND090000
-A					[SM060000	] SM080000		: SP130000	« SP170000	ª SM210000	¡ SP030000	¬ SM660000			² ND021000	
-B	VT SE120000				. SP110000	$ SC030000	, SP080000	# SM010000	» SP180000	º SM200000	¿ SP160000	| SM130000	ô LO150000	û LU150000		
-C	FF SE130000	FS SE350000		DC4 SE210000	< SA030000	* SM040000	% SM020000	@ SM050000		æ LA510000			ö LO170000	ü LU170000	Ö LO180000	Ü LU180000
-D	CR SE140000	GS SE360000	ENQ SE060000	NAK SE220000	(SP060000	) SP070000	_ SP090000	' SP050000					ò LO130000	ù LU130000		
-E	SO SE150000	RS SE370000	ACK SE070000		+ SA010000	; SP140000	> SA050000	= SA040000		Æ LA520000			ó LO110000	ú LU110000		
-F	SI SE160000	US SE380000	BEL SE080000	SUB SE270000	! SP020000	^ SD150000	? SP150000	" SP040000	± SA020000					ÿ LY170000		

Figure 129. Subset of EBCDIC code page 500 that can be translated to GLI 0

Bit 1 Escape-sequence handling (for bytes n+1 to end)

If this flag is B'0', each X'5C' (backslash) within the bar code data is treated as an escape character according to the PDF417 symbology specification.

If this flag is B'1', each X'5C' within the bar code data is treated as a normal data character and therefore all escape sequences are ignored. In this case, no GLI code page switching and no reader programming can occur within the data.

Note: If the EBCDIC-to-ASCII translation flag is also set to B'1', all EBCDIC backslash characters (X'E0') are first converted into X'5C' before the escape-sequence handling flag is applied.

Bits 2—7
Reserved

Byte 6 Data symbol characters per row

This parameter specifies the number of data symbol characters per row. Each row consists of a start pattern, a left row indicator codeword, 1 to 30 data symbol characters, a right row indicator codeword (omitted in a truncated symbol), and a stop pattern. The aspect ratio of the bar code symbol is determined by the number of data symbol characters and the number of rows.

Exception condition EC-0F06 exists if an invalid number of data symbol characters per row is specified.

Because of the Error Checking and Correction (ECC) algorithm and the data compaction method used by the printer when the symbol is built, the number of data symbol characters is not necessarily the same as the number of characters in the bar code data.

Byte 7 Desired number of rows

This parameter specifies the desired number of rows in the bar code symbol. From 3 to 90 rows can be specified or X'FF' can be specified to instruct the printer to generate the minimum number of rows necessary. The number of rows times the number of data symbol characters per row cannot exceed 928. Exception condition EC-0F07 exists if an invalid number of rows is specified.

The actual number of rows generated depends on the amount of data to be encoded and on the security level selected. If more rows than necessary are specified, the symbol is padded to fill the requested number of rows. If not enough rows are specified, enough extra rows are inserted by the printer to produce the symbol.

If too much data is specified to fit in the bar code symbol, exception condition EC-0F08 exists.

Byte 8 Security level

This parameter specifies the desired security level for the symbol as a value between 0 and 8. Each higher security level causes more error correction codewords to be added to the symbol. At a particular security level, a number of codewords can be missing or erased and the symbol can still be recovered. Also, PDF417 can recover from mis-decodes of codewords. The formula is: Maximum Limit >= Erasures + 2*Misdecodes. The relation of security level to error correction capability is as follows:

Security level	Maximum Limit >= Erasures + 2*Misdecodes
0	0
1	2
2	6
3	14

Security level	Maximum Limit >= Erasures + 2*Misdecodes
4	30
5	62
6	126
7	254
8	510

For example, at security level 6, a total of 126 codewords can be either missing or destroyed and the entire symbol can still be completely recovered. The following table provides a recommended security level for various amounts of data:

Table 30. Caption. Description

Number of Data Codewords	Recommended Security Level
1—40	2
41—160	3
161—320	4
321—863	5

Exception condition EC-0F09 exists if an invalid security level value is specified.

Bytes 9–10

Length of Macro PDF417 Control Block that follows

This field specifies the length of a Macro PDF417 Control Block that follows in bytes 11—*n*; this length does not contain the length field itself.

If X'0000' is specified, there is no Macro PDF417 Control Block specified as a special function and this is the last field of the special-function parameters; what follows is the bar code data itself.

If a value between X'0001' and X'7FED' is specified, the BCOCA receiver builds a Macro PDF417 Control Block at the end of the bar code symbol using the data in bytes 11—*n*.

If an invalid length value is specified, exception condition EC-0F0C exists.

Bytes 11—*n*

Macro PDF417 Control Block data

The special codewords “\922”, “\923”, and “\928” are used for coding a Macro PDF417 Control Block as defined in section G.2 of the Uniform Symbology Specification PDF417, but these codewords must not be used within the bar code data. Exception condition EC-2100 exists if one of these escape sequences is found in the bar code data. If a Macro PDF417 Control Block is needed, it is specified in bytes 11—*n*.

The data for this Macro PDF417 Control Block must adhere to the following format; exception condition EC-0F0D exists if this format is not followed:

For the symbol in a Macro PDF417 that represents the last segment of the Macro PDF417, the data must contain “\922”. For all symbols in a Macro PDF417, except the one representing the last segment:

- A Macro PDF417 Control Block starts with a “\928” escape sequence.

- Followed by 1 to 5 numeric digits (bytes values X'30' to X'39'), representing a segment index value from 1 to 99,999.
- Followed by a variable number of escape sequences containing values from “\000” to “\899”, representing the file ID.
- Followed by zero or more optional fields, with the following layout:
  - “\923” escape sequence, signalling an optional field
  - Escape sequence containing the field designator with a value from “\000” to “\006”
  - Followed by a variable number of text characters (for field designators “\000”, “\003”, and “\004”) or a variable number of numeric digits (for field designators “\001”, “\002”, “\005”, and “\006”). The field designators are defined in Table G1 of the Uniform Symbology Specification. For text characters, the byte values must be X'09', X'0A', X'0D', or from X'20' through X'7E'. These values represent the upper case letters A through Z, the lower case letters a through z, and the digits 0 through 9, plus some punctuation and special characters (for GLI 0). For the numeric digits, the byte values must be from X'30' through X'39'.
    - For field designator “\001”, the one to five numeric digits that follow represent the segment count. This value must be greater than or equal to the segment index value.
    - For field designator “\002”, the one to eleven numeric digits that follow represent the time stamp on the source file expressed as the elapsed time in seconds since January 1, 1970 00:00 GMT.
    - For field designator “\005”, one or more numeric digits must follow.
    - For field designator “\006”, the one to five numeric digits that follow represent the decimal value of the 16-bit CRC checksum over the entire source file. This checksum value must be a decimal value from 0 through 65,535.

Note that the file name, segment count, time stamp, sender, addressee, file size, and checksum are provided in the optional fields of the Macro PDF417 Control Block and the BCOCA receiver makes no attempt to calculate or verify these values (other than the previously stated restrictions). If the Macro PDF417 Control Block data does not follow these rules, exception condition EC-0F0D exists. Note that the Uniform Symbology Specification PDF417 has the following additional claims. The BCOCA receiver does not check for these claims nor does it report any exceptions conditions if these claims are violated:

- If the optional Segment Count is given in the Macro PDF417 Control Block of one of the segments (symbols) of the macro, then it should be used in all of the segments (symbols) of the macro.
- All optional fields, other than the Segment Count, only need to appear in one of the segments (symbols) of the macro.
- If an optional field with the same field designator appears in more than one segment (symbol) of the same macro, then it must appear identically in every segment (symbol).

QR Code Special-Function Parameters

Offset	Type	Name	Range	Meaning	BCD1 Range
5	BITS			Control flags	
bit 0		EBCDIC	 B'0' B'1'	EBCDIC-to-ASCII translation: Do not translate Convert data from EBCDIC to ASCII	Not supported in BCD1
bit 1		Escape sequence handling	 B'0' B'1'	Escape-sequence handling: Process escape sequences Ignore all escape sequences	Not supported in BCD1
bits 2—7			B'000000'	Reserved	
6	CODE	EBCDIC code page	 X'00' X'01' X'02' X'03'	EBCDIC code page used to encode data: No code page specified Code page 500 (International #5) Code page 290 (Japanese Katakana Ext.) Code page 1027 (Japanese Latin Extended)	Not supported in BCD1
7	CODE	Version	 X'00' X'01' — X'28'	Version of symbol: Smallest symbol Version number (1 to 40)	Not supported in BCD1
8	CODE	Error correction level	 X'00' X'01' X'02' X'03'	Level of error correction: Level L (7% recovery) Level M (15% recovery) Level Q (25% recovery) Level H (30% recovery)	Not supported in BCD1
9	UBIN	Sequence indicator	X'00'—X'10'	Structured append sequence indicator	Not supported in BCD1
10	UBIN	Total symbols	X'00' or X'02'—X'10'	Total number of structured-append symbols	Not supported in BCD1
11	UBIN	Parity Data	X'00'—X'FF'	Structured append parity data	X'00'—X'FF'
12	BITS			Special-function flags	
bit 0		UCC/ EAN FNC1	 B'0' B'1'	Alternate data type identifier: User-defined symbol Symbol conforms to UCC/EAN standards	Not supported in BCD1
bit 1		Industry FNC1	 B'0' B'1'	Alternate data type identifier: User-defined symbol Symbol conforms to industry standards	Not supported in BCD1
bits 2–7			B'000000'	Reserved	

Offset	Type	Name	Range	Meaning	BCD1 Range
13	CODE	Application indicator	See field description	Application indicator for Industry FNC1	Not supported in BCD1

A desired symbol size is specified by the version parameter (byte 7), but the actual size of the symbol depends on the amount of data to be encoded. If not enough data is supplied, the symbol will be padded with null data to reach the requested symbol size. If to much data is supplied for the requested symbol size, the symbol will be bigger than requested and will be the smallest symbol that can accommodate that amount of data.

Byte 5 Control flags

These flags control how the barcode data (bytes *n*+1 to end) is processed by the BCOCA receiver; the receiver can be an IPDS printer or any other product that processes BCOCA objects.

Bit 0 EBCDIC-to-ASCII translation.

If this flag is B'0', the data is assumed to begin in the default character encodation (ECI 000020) and no translation is done.

If this flag is B'1' and an EBCDIC code page is selected in byte 6, the BCOCA receiver will convert each byte of the barcode data from the EBCDIC code page specified in byte 6 into ASCII code page 897 before this data is used to build the barcode symbol. The following EBCDIC code pages can be used to encode the barcode data:

- Code page 500 (International #5) — specify X'01' in byte 6.

  Only 128 of the characters within ECI 000020 can be specified in code page 500. The code page 500 characters that can be translated are shown in
- Code page 290 (Japanese Katakana Extended) — specify X'02' in byte 6.
- Code page 1027 (Japanese Latin Extended) — specify X'03' in byte 6.

EBCDIC characters that are not defined within ECI 000020 are mapped to X'7F' (DEL).

Bit 1 Escape-sequence handling.

If this flag is B'0', each X'5C' within the barcode data is treated as an escape character according to the QR Code symbology specification.

If this flag is B'1', each X'5C' within the barcode data is treated as a normal data character and therefore all escape sequences are ignored. In this case, no ECI code page switching can occur within the data.

Note: If the EBCDIC-to-ASCII translation flag is also set to B'1', all EBCDIC characters will first be converted into X'5C' before the escape-sequence handling flag is applied.

Byte 6 Conversion

When the EBCDIC-to-ASCII translation flag is B'1', this parameter specifies the method used to convert EBCDIC input data into the default character encodation. When the EBCDIC-to-ASCII translation flag is B'0', this parameter is not used and should be set to X'00'.

For the first three values (used when the input data is encoded with a single-byte EBCDIC code page), this parameter identifies the EBCDIC code page that encodes single-byte EBCDIC bar code data. The following EBCDIC code pages are supported:

X'01' Code page 500 (International #5)

Only 128 of the characters within ECI 000020 can be specified in code page 500. The code page 500 characters that can be translated are shown in Figure 130 on page 583.

X'02' Code page 290 (Japanese Katakana Extended)

X'03' Code page 1027 (Japanese Latin Extended)

For the remaining values (used when the input data is SOSI), this parameter identifies the desired conversion from EBCDIC SOSI input data to a specific mixed-byte ASCII encoding.

Note: The values X'04' through X'09' are defined for the Additional Bar Code Parameters (X'7B') triplet used with AFP Line Data; these values are not valid within a BCOCA object built for a non-line-data environment, such as MO:DCA and IPDS. Refer to the *Advanced Function Presentation: Programming Guide and Line Data Reference* for a description of the Additional Bar Code Parameters (X'7B') triplet.

The following choices are supported:

X'04' CCSID 1390 to CCSID 943

Convert from:
CCSID 1390 – Extended Japanese Katakana-Kanji Host Mixed for JIS X0213 including 6205 UDC, Extended SBCS (includes SBCS & DBCS euro)

Convert to:
CCSID 943 – Japanese PC Data Mixed for Open environment (Multi-vendor code): 6878 JIS X 0208-1990 chars, 386 IBM selected DBCS chars, 1880 UDC (X'F040' to X'F9FC')

X'05' CCSID 1399 to CCSID 943

Convert from:
CCSID 1399 – Extended Japanese Latin-Kanji Host Mixed for JIS X0213 including 6205 UDC, Extended SBCS (includes SBCS & DBCS euro)

Convert to:
CCSID 943 – Japanese PC Data Mixed for Open environment (Multi-vendor code): 6878 JIS X 0208-1990 chars, 386 IBM selected DBCS chars, 1880 UDC (X'F040' to X'F9FC')

X'06' CCSID 1390 to CCSID 932

Convert from:
CCSID 1390 – Extended Japanese Katakana-Kanji Host Mixed for JIS X0213 including 6205 UDC, Extended SBCS (includes SBCS & DBCS euro)

Convert to:
CCSID 932 – Japanese PC Data Mixed including 1880 UDC

X'07' CCSID 1399 to CCSID 932

Convert from:
CCSID 1399 – Extended Japanese Latin-Kanji Host Mixed for JIS X0213 including 6205 UDC, Extended SBCS (includes SBCS & DBCS euro)

Convert to:
CCSID 932 – Japanese PC Data Mixed including 1880 UDC

X'08' CCSID 1390 to CCSID 942

Convert from:
CCSID 1390 – Extended Japanese Katakana-Kanji Host Mixed for JIS X0213 including 6205 UDC, Extended SBCS (includes SBCS & DBCS euro)

Convert to:
CCSID 942 – Japanese PC Data Mixed including 1880 UDC, Extended SBCS

X'09' CCSID 1399 to CCSID 942

Convert from:
CCSID 1399 – Extended Japanese Latin-Kanji Host Mixed for JIS X0213 including 6205 UDC, Extended SBCS (includes SBCS & DBCS euro)

Convert to:
CCSID 942 – Japanese PC Data Mixed including 1880 UDC, Extended SBCS

EBCDIC characters that are not defined within ECI 000020 are mapped to the substitute character, X'7F' or X'FCFC'; exception condition EC-2100 exists when an undefined character is encountered.

Exception condition EC-0F0E exists if an invalid or unsupported conversion value is specified.

Hex Digits 1st ⟶ 2nd ↓	0-	1-	2-	3-	4-	5-	6-	7-	8-	9-	A-	B-	C-	D-	E-	F-
-0	NUL SE010000	DLE SE170000			(SP) SP010000	& SM030000	_ SP100000						{ SM110000	} SM140000		0 ND100000
-1	SOH SE020000	DC1 SE180000					/ SP120000		a LA010000	j LJ010000			A LA020000	J LJ020000		1 ND010000
-2	STX SE030000	DC2 SE190000		SYN SE230000					b LB010000	k LK010000	s LS010000	¥ SC050000	B LB020000	K LK020000	S LS020000	2 ND020000
-3	ETX SE040000	DC3 SE200000							c LC010000	l LL010000	t LT010000		C LC020000	L LL020000	T LT020000	3 ND030000
-4									d LD010000	m LM010000	u LU010000		D LD020000	M LM020000	U LU020000	4 ND040000
-5	HT SE100000		LF SE110000						e LE010000	n LN010000	v LV010000		E LE020000	N LN020000	V LV020000	5 ND050000
-6		BS SE090000	ETB SE240000						f LF010000	o LO010000	w LW010000		F LF020000	O LO020000	W LW020000	6 ND060000
-7	DEL SE330000		ESC SE280000	EOT SE050000					g LG010000	p LP010000	x LX010000		G LG020000	P LP020000	X LX020000	7 ND070000
-8		CAN SE250000							h LH010000	q LQ010000	y LY010000		H LH020000	Q LQ020000	Y LY020000	8 ND080000
-9		EM SE260000						` SD130000	i LI010000	r LR010000	z LZ010000		I LI020000	R LR020000	Z LZ020000	9 ND090000
-A					[SM060000	] SM080000		: SP130000								
-B	VT SE120000				. SP110000	$ SC030000	, SP080000	# SM010000				| SM130000				
-C	FF SE130000	FS SE350000		DC4 SE210000	< SA030000	* SM040000	% SM020000	@ SM050000				– SM150000				
-D	CR SE140000	GS SE360000	ENQ SE060000	NAK SE220000	(SP060000	) SP070000	_ SP090000	' SP050000								
-E	SO SE150000	RS SE370000	ACK SE070000		+ SA010000	; SP140000	> SA050000	= SA040000								
-F	SI SE160000	US SE380000	BEL SE080000	SUB SE270000	! SP020000	^ SD150000	? SP150000	" SP040000								

Figure 130. Subset of EBCDIC Code Page 500 that can be translated to ECI 000020

Byte 7 Version of symbol.

This parameter specifies the desired size of the symbol; each version specifies a particular number of modules per row and column. The size of each square module is specified by the module width parameter (byte 17 in the BSD). The following table lists the complete set of supported versions. Exception condition EC-0F0F exists if an invalid version value is specified.

Table 31. Supported Version for a QR Code symbol

Version	Symbol Size	Version	Symbol Size
0 (X'00')	smallest	21 (X'15')	101x01
1 (X'01')	21x21	22 (X'16')	105x105
2 (X'02')	25x25	23 (X'17')	109x109

Table 31. Supported Version for a QR Code symbol (continued)

Version	**Symbol Size**	**Version**	**Symbol Size**
3 (X'03')	29x29	24 (X'18')	113x113
4 (X'04')	33x33	25 (X'19')	117x117
5 (X'05')	37x37	26 (X'1A')	121x121
6 (X'06')	41x41	27 (X'1B')	125x125
7 (X'07')	45x45	28 (X'1C')	129x129
8 (X'08')	49x49	29 (X'1D')	133x133
9 (X'09')	53x53	30 (X'1E')	137x137
10 (X'0A')	57x57	31 (X'1F')	141x141
11 (X'0B')	61x61	32 (X'20')	145x145
12 (X'0C')	65x65	33 (X'21')	149x149
13 (X'0D')	69x69	34 (X'22')	153x153
14 (X'0E')	73x73	35 (X'23')	157x157
15 (X'0F')	77x77	36 (X'24')	161x161
16 (X'10')	81x81	37 (X'25')	165x165
17 (X'11')	85x85	38 (X'26')	169x169
18 (X'12')	89x89	39 (X'27')	173x173
19 (X'13')	93x93	40 (X'28')	177x177
20 (X'14')	97x97		

If X'00' is specified for this parameter, an appopriate row/column size will be used based on the amount of symbol data; the smallest symbol that can accommodate the amount of data is produced.

Byte 8 Level of error correction.

This parameter specifies the level of error correction to be used for the symbol. Each higher level of error correction causes more error correction codewords to be added to the symbol and therefore leaves fewer codewords for symbol data. Refer to the QR Code symbology specification for more information about how many codewords are available for symbol data for each version and error-correction level combination.

Four different levels of Reed-Solomon error correction can be selected:
Level L (X'00') allows recovery of 7% of symbol codewords.
Level M (X'01') allows recovery of 15% symbol codewords.
Level Q (X'02') allows recovery of 25% symbol codewords.
Level H (X'03') allows recovery of 30% symbol codewords.

Exception condition EC-0F10 exists if an invalid level-of-error-correction value is specified.

Byte 9 Structured append sequence indicator.

Multiple QR Code barcode symbols (called structured appends) can be logically linked together to encode large amounts of data. The logically linked symbols can be presented on the same or on different physical media, and are logically recombined after they are scanned. From 2 to 16 QR Code symbols can be linked. This parameter specifies where this symbol is logically linked (1–16)) in a sequence of symbols.

If X'00' is specified for this parameter, this symbol is not part of a structured append. Exception condition EX-0F01 exists if an invalid sequence indicator value is specified. Exception condition EC-0F02 exists if the sequence indicator is larger than the total number of symbols (byte 10).

Byte 10

Total number of structured-append symbols.

This parameter specifies the total number of symbols (2–16) that is logically linked in a sequence of symbols.

If X'00' is specified for this parameter, this symbols is not part of a structured append. If this symbol is not part of a structured append, both bytes 9 and 10 must be X'00', or exception condition EC-0F03 exists.

Exception condition EC-0F04 exists if an invalid number of symbols is specified.

Byte 11

Structured append parity data.

This parameter specified parity data for a structured append symbol. The parity-data value must be calculated from the entire message that is broken into structured-append symbols; the parity-data value should be the same in each of the structured-append symbols.

The parity-data value is obtained by XORing byte by byte the ASCII/JIS values of all the original input data before division into structured-append symbols.

If this symbol is not a structured append, this parameter is ignored and should be set to X'00'.

Byte 12

Special-function flags.

These flags specify special functions that can be used with a QR Code symbol.

Bit 0 UCC/EAN FNC1 alternate data type identifier.

If this flag B'1', this QR Code symbol will indicate that it conforms to the UCC/EAN application identifiers standard. In this case, the industry FNC1 flag must be B'0'. Exception condition EC-0F11 exists if an incompatible combination of these bits is specified.

Bit 1 Industry FNC1 alternate data type identifier.

If this flag is B'1', this QR Code symbol will indicate that it conforms to the specific industry or application specifications previously agreed with AIM International. In this case, the UCC/EAN FNC1 flag must be B'0'. Exception condition EC-0F11 exists if an incompatible combination of these bits is specified.

When this flag is B'1', an application indicator is specified in byte 13.

Bits 2–7

Reserved.

Byte 13

Application indicator for Industry FNC1.

When the Industry FNC1 flag is B'1', this parameter specifies an application indicator. The application indicator is a one-byte value that is specified either as an alphabetic value (from the ASCII set a-z, A-Z) plus 100 or as a two-digit number (between 00 and 99 represented as a hexadecimal value). For example:

for application indicator “a” (ASCII value X'61'), specify X'C5'.
for application indicator “Z” (ASCII value X'5A'), specify X'BE'.
for application indicator “01”, specify X'01'.
for application indicator “99”, specify X'63'.

When the Industry FNC1 flag is B'0', this parameter is ignored and should be set to X'00'.

Exception condition EC0F12 exists if an invalid application-indicator value is specified.

Appendix E. Set Media Origin (SMO)

This appendix was written to further explain how to generate the correct Set Media Origin (SMO) information in a form definition.

Background

IBM 3800-3

The first AFP printer was the IBM 3800-3 delivered in 1983. It had a single, fixed media origin or “top, left-hand corner”as shown by the shaded rectangle in Figure 131 on page 588. Print data could be placed to print across, down, or up the page. Across and down are shown. Page definitions, (pagedefs), were used to place the line data on the page. IBM provided page definitions for common line spacings for both portrait and landscape orientation. The two most common paper sizes used were 12" x 8.5" (shown on left) and 9.5" x 11" (shown on right). As shown below different page definitions are required to print the same output on the two different sizes of paper. For example an “across” page definition is used to print landscape output on 12" x 8.5" paper and a “down” page definition is used for landscape output on 9.5" x 11" paper. Forms, like 12" x 8.5", that have a width greater than their length are referred to as “wide continuous forms” and forms, like 9.5" x 11", that have a length greater than their width are called “narrow continuous forms”.

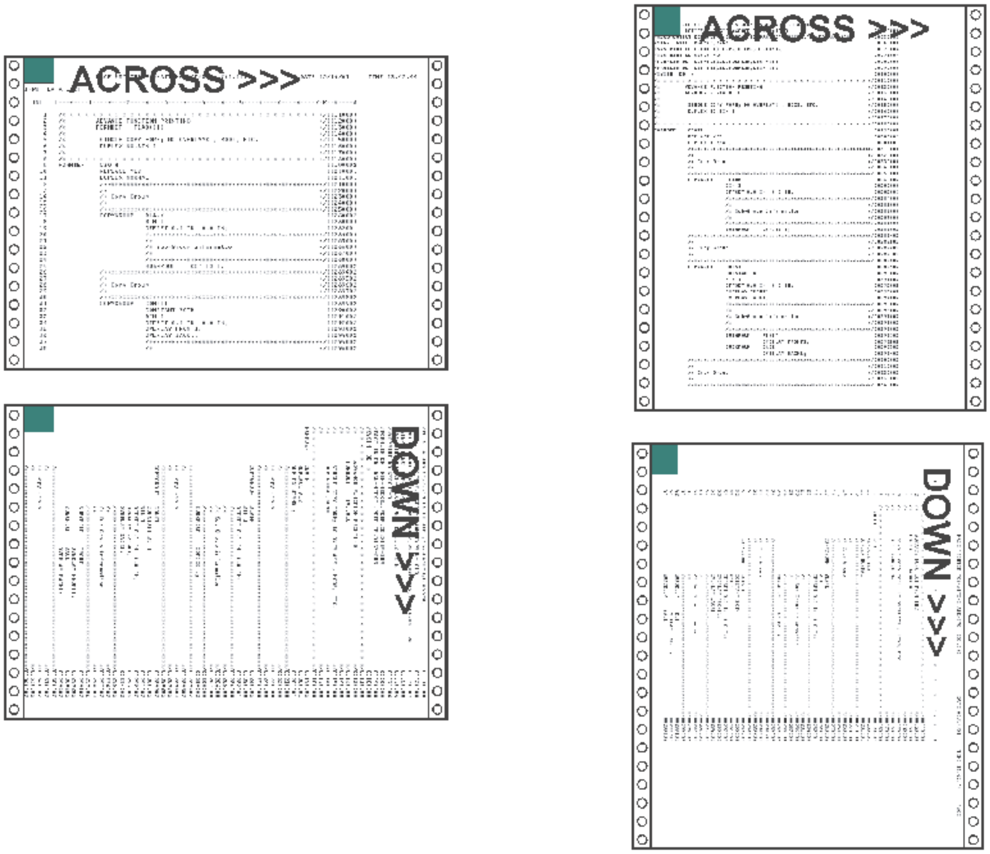


Figure 131. Fixed Media Origins for the IBM 3800–3 Printer

IBM 3820

In 1985 the IBM 3820 was introduced. It was the first IBM AFP cut-sheet printer. Like the 3800-3 it also had a single, fixed media origin as shown. The 3820 could print in the same directions as the 3800-3 plus one new direction, “back”. As shown below it had similar print direction characteristics as a 3800-3 using 9.5" x 11" paper.

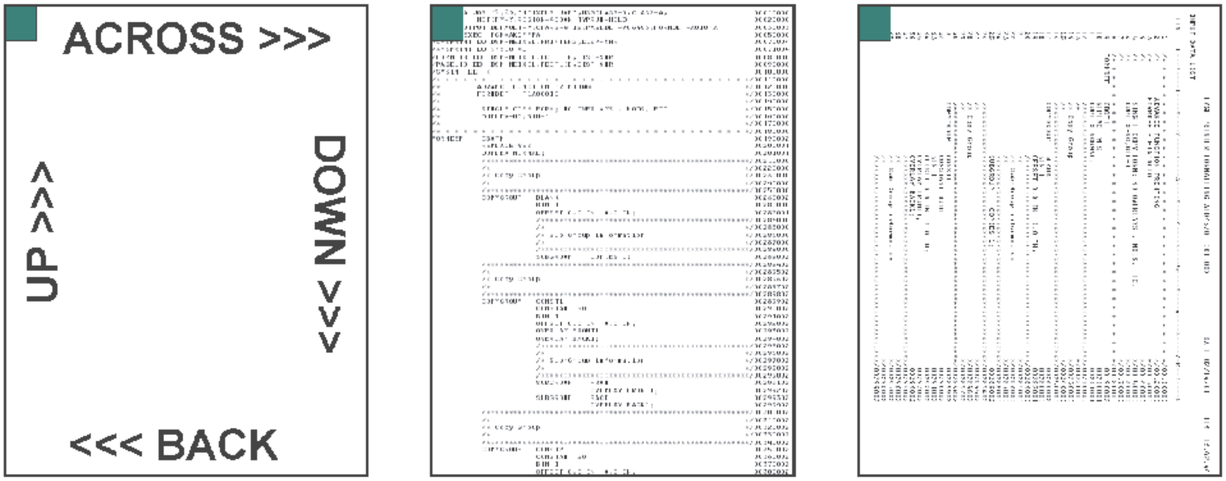


Figure 132. Fixed Media Origins for the IBM 3820 Printer

The Problem

Many customers had both 3800-3s and 3820s. The 3800-3 was the fastest printer of its time at 215 impressions per minute. In order to achieve that speed it had to use the 12" x 8.5" paper. This paper had the additional benefit of reducing maintenance charges because the 3800s usage charge was based on the number of linear feet printed. The use of the shorter, 12" x 8.5" paper cost less per page than the longer, 9.5" x 11" paper. Unfortunately, when the 12" x 8.5" paper is used on the 3800-3 it causes an incompatibility with the 3820. As shown in the figure below the 3800-3 with 12" x 8.5" paper has a different media orientation than the 3820.

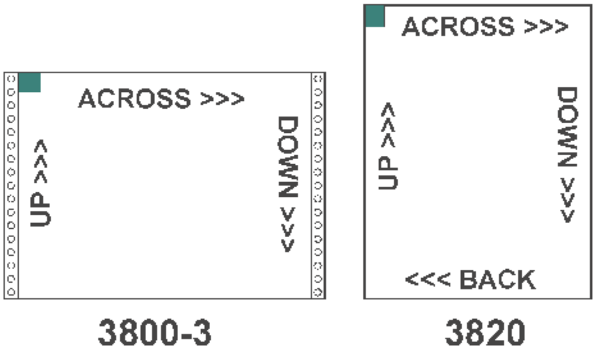


Figure 133. Differences in Media Origin Between the IBM 3800–3 and IBM 3820 Printers

The 3800-3's media origin is at the left end of the long edge and the 3820's is at the left end of the short edge. Because of this different page definitions would be needed to print the same output on both printers. For example, in order to print landscape output an "across" page definition would be used on the 3800-3 and a "down" page definition for the 3820. This would require different page definitions to be specified for each printer.

Another Problem

AFP also provides the ability to print image data. The print direction coded in the page definition controls how the text data is oriented on the page. Unfortunately it has no effect on data contained within an image. In the figure below an image containing the word, “LOGO” has been placed on the 3800-3 and 3820 pages. It is oriented as desired on the 3820 but appears to be rotated 90 degrees counterclockwise on the 3800-3. In reality the image has not been rotated, the paper has. In order to compensate for this a special, rotated version of the image had to be built for use on the 3800-3 and care taken to use the proper version on both printers.

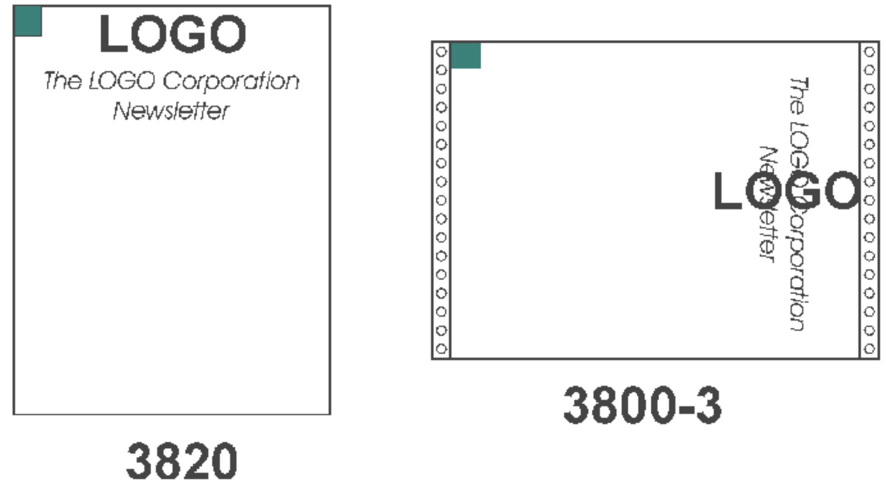


Figure 134. Rotated Text and Image Data

When IBM was developing its second, continuous forms AFP printer, the 3835, it was decided to develop a solution for the problem of different media origins between cut-sheet and continuous forms printers. The AFP architecture was enhanced to allow the media origin to be moved to any of the four corners of the paper. This function is called Set Media Origin and is controlled by a value in the form definition or formdef. This value is called the Medium Origin and is set using the Page Printer Formatting Aid, (PPFA), **PRESENT** and **DIRECTION** parameters on the **FORMDEF** and **COPYGROUP** commands.

FORMDEF PRESENT and DIRECTION Parameters

The use of **PRESENT** and **DIRECTION** parameters on the **FORMDEF** is confusing. The examples in “The SMO Reference Pages” on page 591 show a sheet of paper and the placement of the Medium Origin for a particular **PRESENT** and **DIRECTION** combination. Notice that for a particular Medium Origin combination, the results for cut-sheet paper, wide continuous forms paper, narrow continuous forms paper, and Cut Sheet Emulation are different. This was done to guarantee that the application pages would be oriented in the same manner on all printer and media types. Cut Sheet Emulation, (CSE), divides a continuous forms printer's paper web into two equal sheetlets.

The **PRESENT** parameter has two possible values of **PORTRAIT** and **LANDSCAPE**. The **DIRECTION** has values of **ACROSS** and **DOWN**. There is an additional optional parameter **CUTSHEET**. It specifies whether the SMO command will be sent to cut-sheet printers.[13] This is invoked by coding a value of **YES**. If **NO** is coded or allowed to default the media origin on cut-sheet printers will not

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[13] Some older printers do not support the SMO function.

be changed and will be at the default location which is equivalent to a form definition with **PRESENT PORTRAIT** and **DIRECTION ACROSS**. Coding the **N_UP** parameter, (1-up, 2-up, 3-up, 4-up), has the same effect as coding **CUTSHEET**. The **CUTSHEET** parameter was created to allow form definitions that did not have N-UP coded to cause SMO to be enabled on cut-sheet printers.

When Print Services Facility (PSF) or Infoprint® Manager (IPM) converts an output file to Intelligent Printer Data Stream (IPDS) to send to the printer it includes an SMO value if SMO is supported by the printer. This value is calculated by examining the Medium Origin of the form definition and then checking to see if the printer is cut-sheet, wide continuous, or narrow continuous. CSE on the printer will report back wide or narrow continuous as appropriate. PSF/IPM then specifies the proper SMO. The resulting SMO values are included in the figures for completeness.

The SMO Reference Pages

The following pages show how the four possible SMO combinations behave on the following four different printer types:
- Cut-sheet
- Continuous forms with wide paper
- Continuous forms with narrow paper
- Continuous forms with Cut Sheet Emulation enabled.

There are four summary pages that show the media origin and print directions for the above printer types. These are followed by detail pages. The top of each detail page shows the:
- Printer type
- Values for Presentation and Direction coded on the form definition used
- Medium Origin value that this combination produces.

The page shows six images of a single paper sheet. The media origin or “top, left-hand corner” is shown with a shaded rectangle. The top three sheets show how data is oriented for:
- Simplex sheet or front of a duplex sheet
- Back of a normal duplex sheet
- Back of a tumble duplex sheet.

Simulated hole punches and rotation axis lines are provided to help visualize how the back of a duplex sheet relates to the front. An image made from a photograph is included on these sheets to help understand the orientation. The top, left-hand corner of the image is in the same corner as the media origin.

The leftmost sheet on the bottom row shows the four print directions and how they relate to the media origin. The middle sheet shows sample line data formatted using a page definition coded with an “across” print direction. The rightmost sheet shows data formatted with a page definition coded with a “down” print direction. The page definition name, its direction, total lines, and lines-per-inch spacing are given below each page.

Cut-Sheet Printer

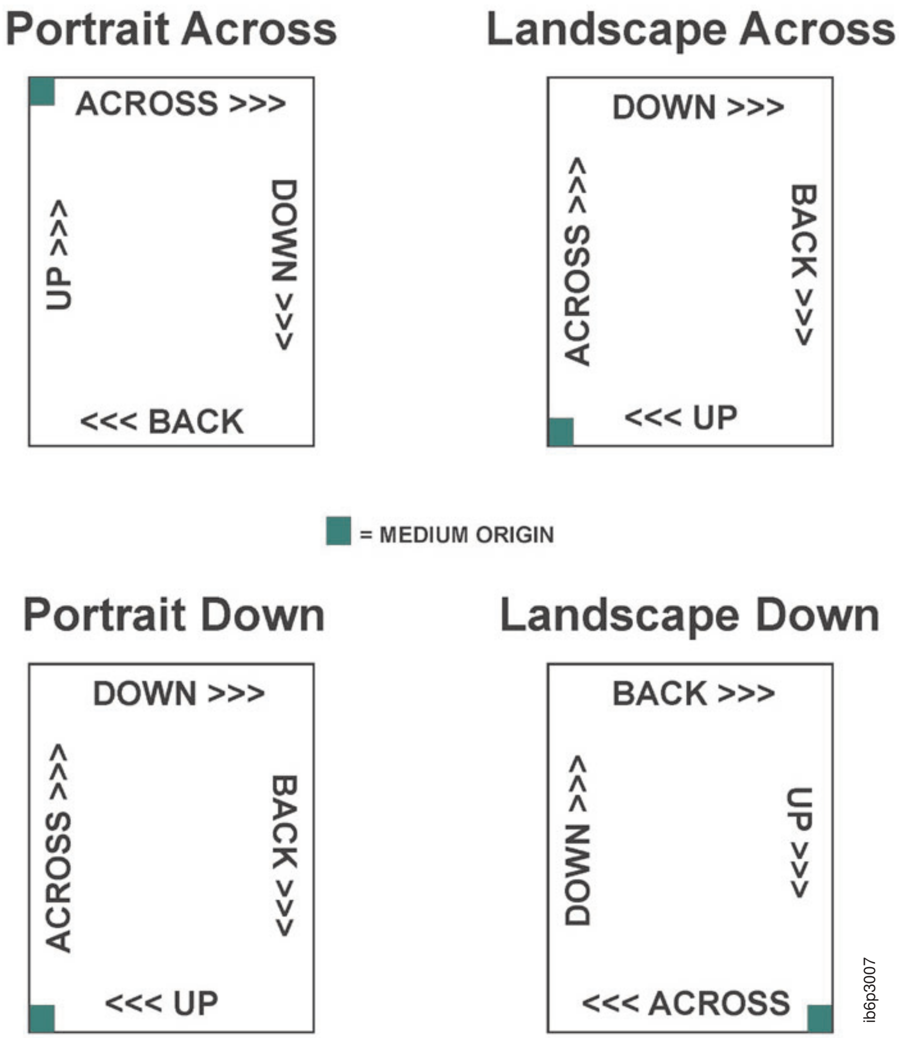


Figure 135. Cut-Sheet Printer Summary of Set Medium Origin

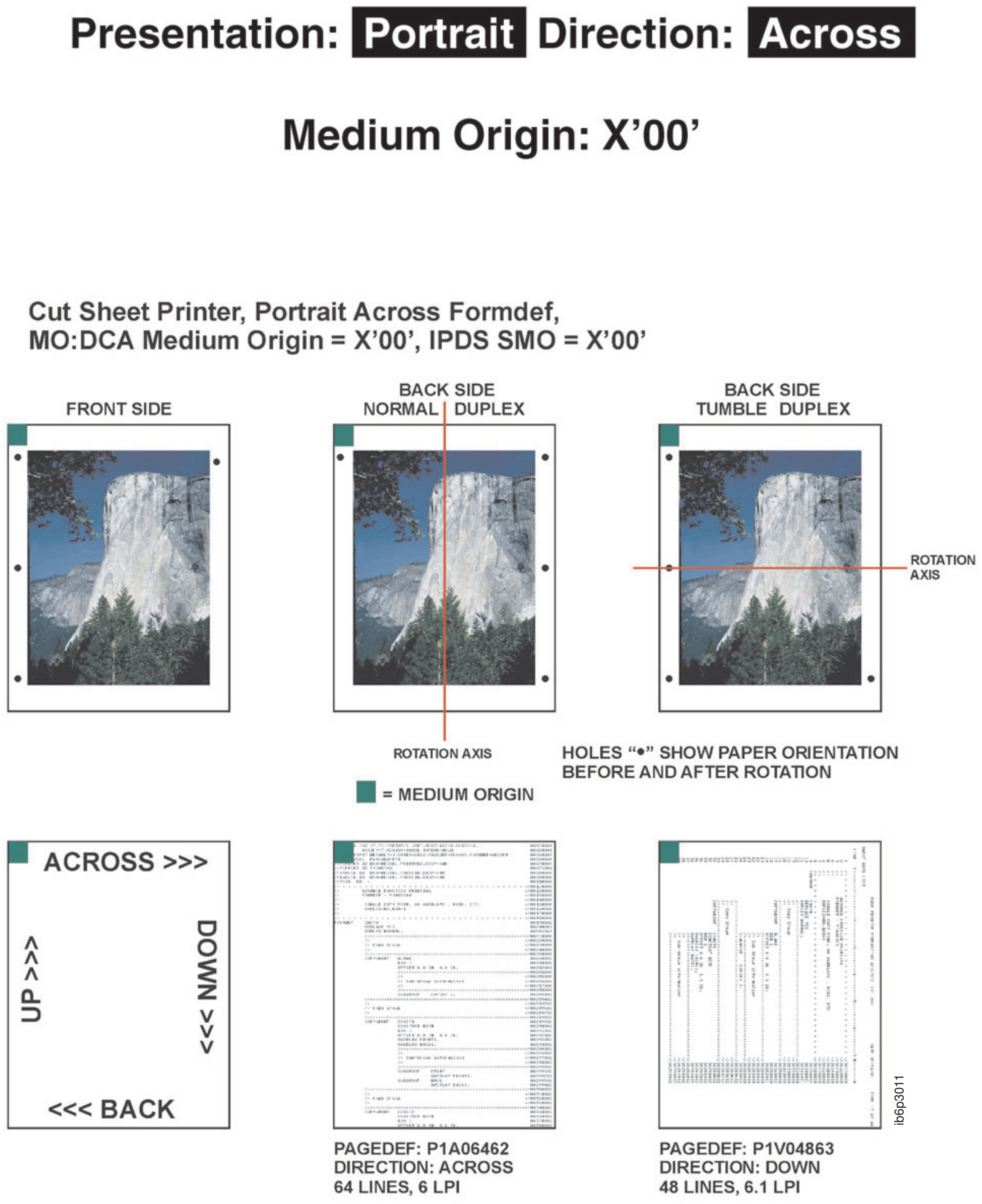


Figure 136. Cut-Sheet Printer with a Medium Origin of X'00'

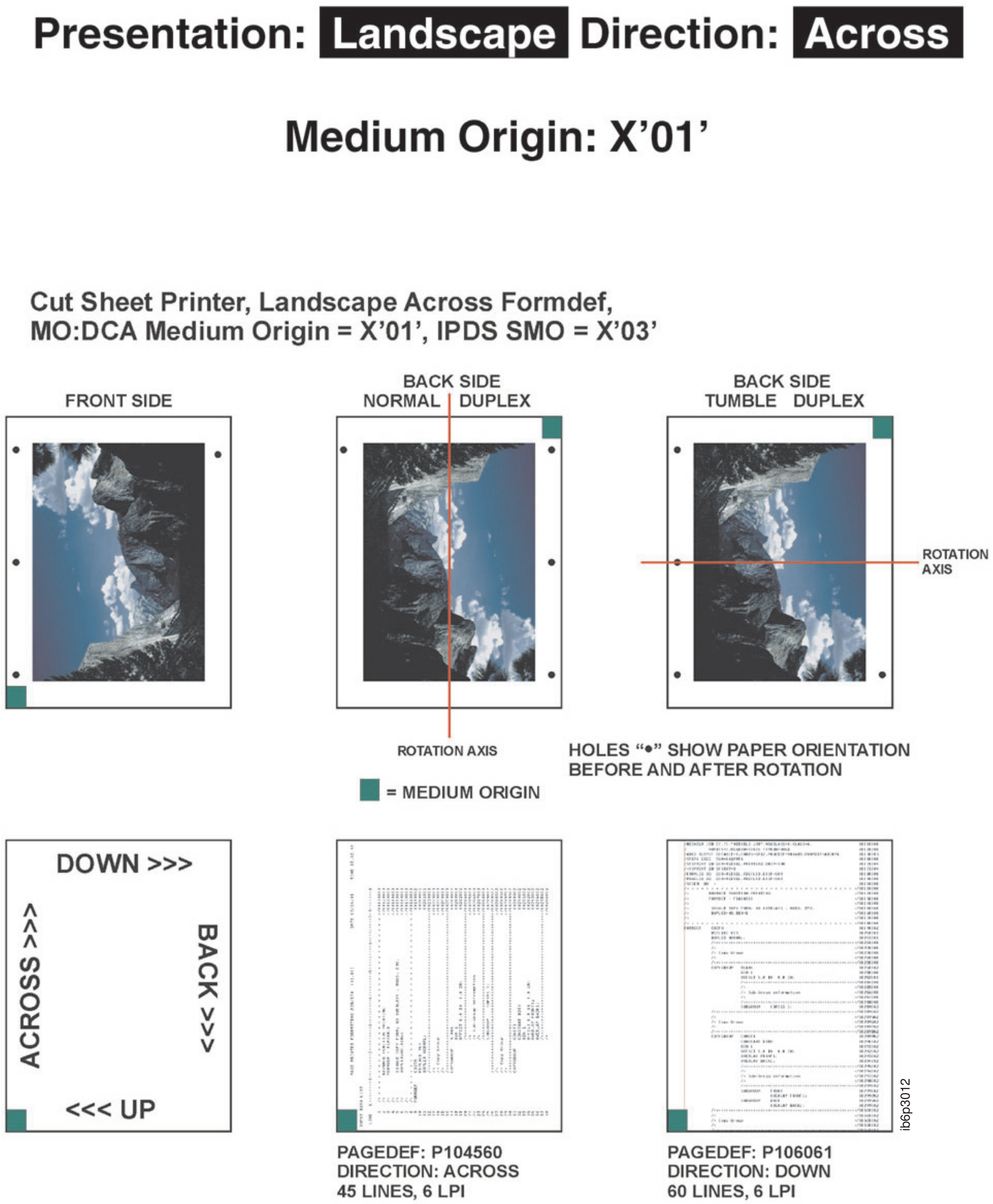


Figure 137. Cut-Sheet Printer with a Medium Origin of X'01'

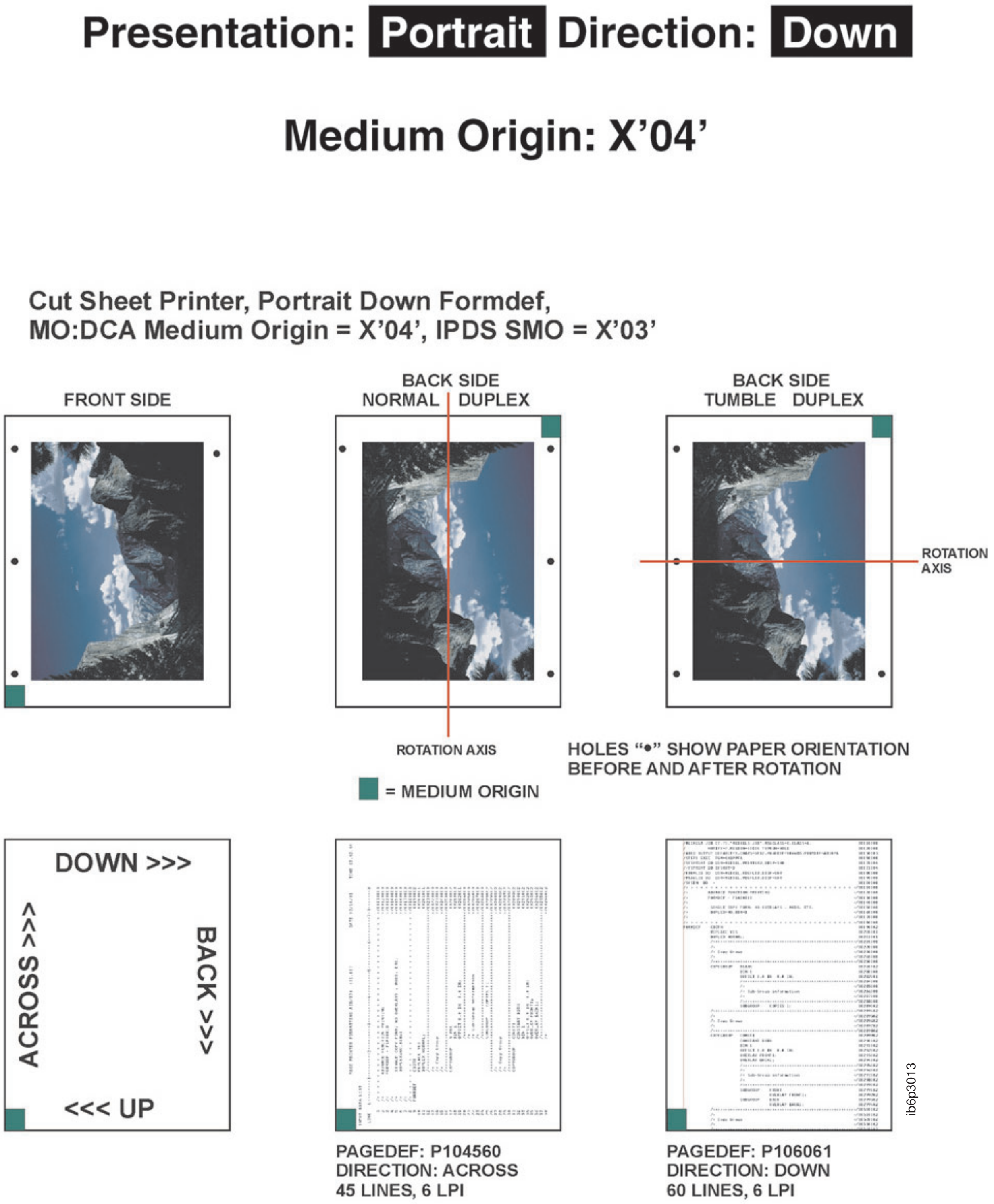


Figure 138. Cut-Sheet Printer with a Medium Origin of X'04'

Presentation: Landscape Direction: Down

Medium Origin: X'05'

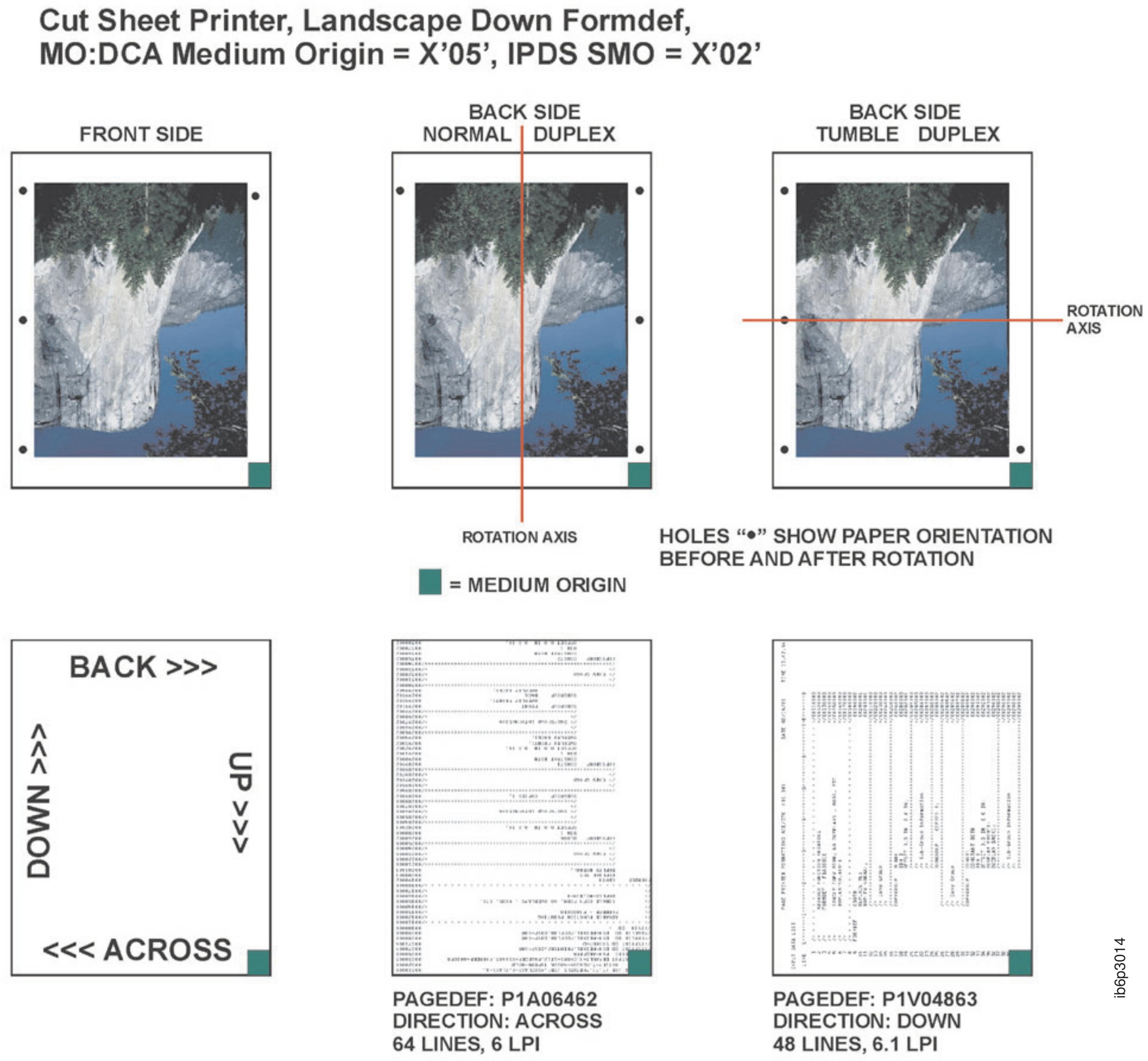


Figure 139. Cut-Sheet Printer with a Medium Origin of X'05'

Wide Continuous Forms Paper

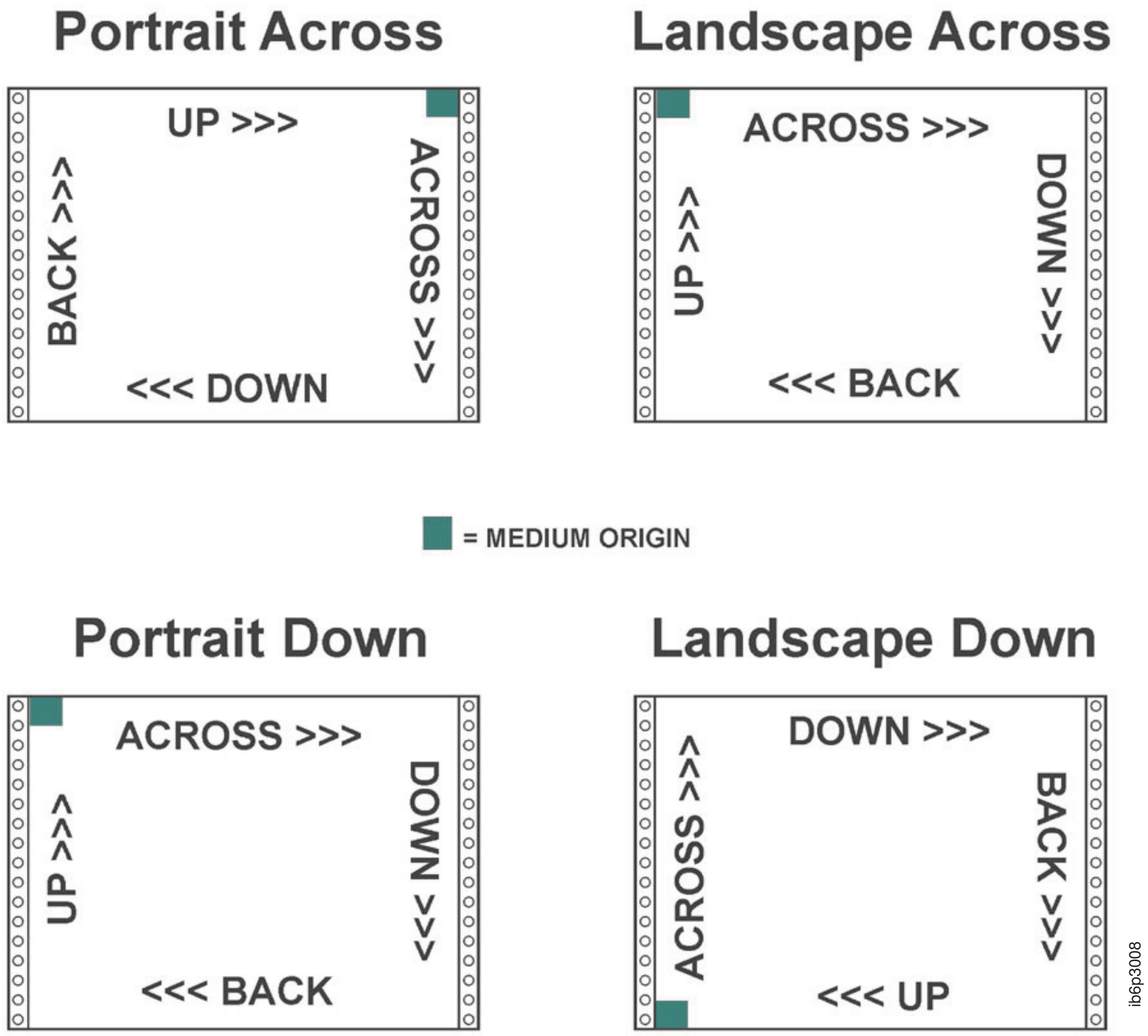


Figure 140. Wide Continuous Forms Printer Paper Summary of Set Media Origin

Presentation: Portrait Direction: Across

Medium Origin: X'00'

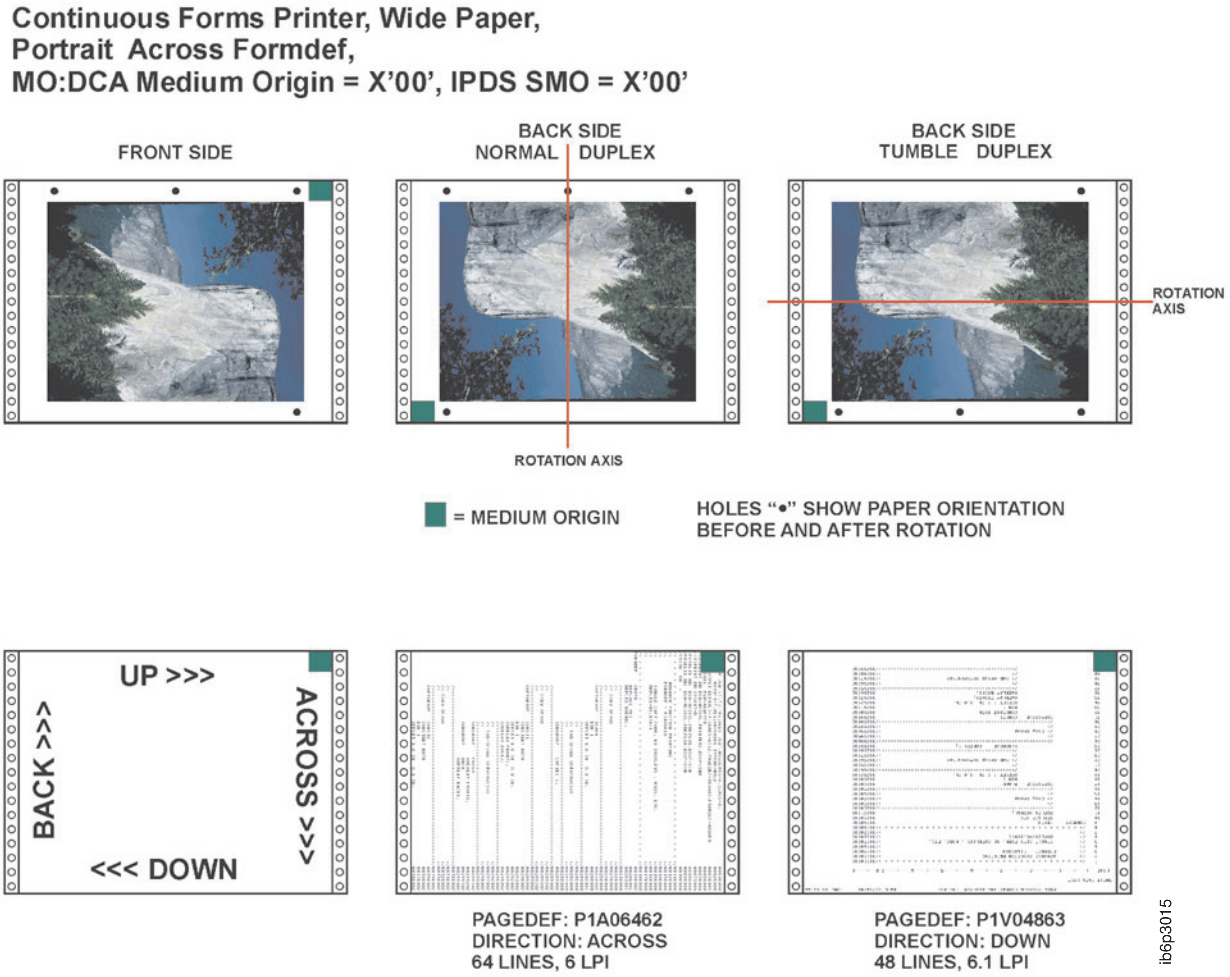


Figure 141. Wide Continuous Forms Printer Paper with a Medium Origin of X'00'

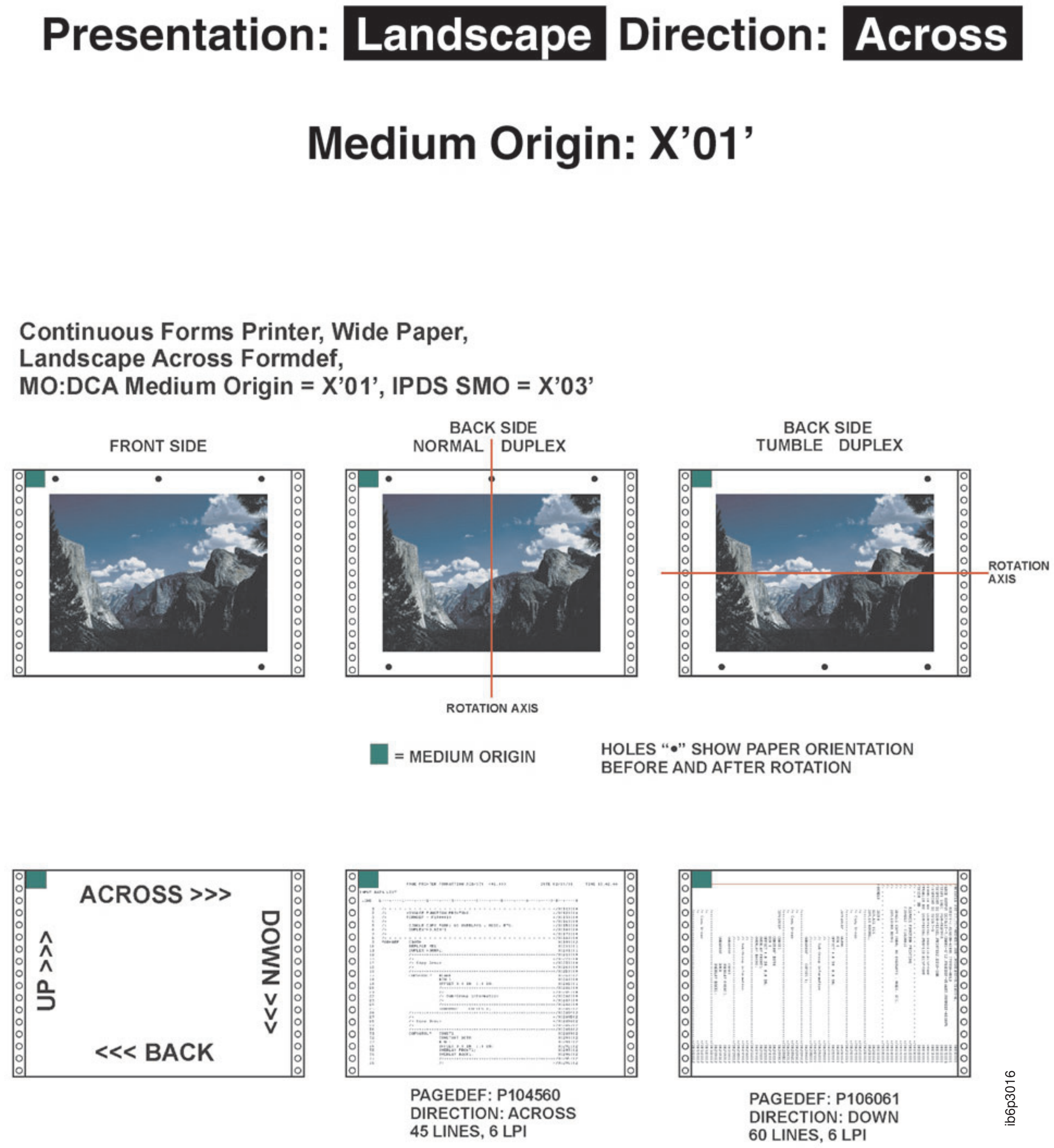


Figure 142. Wide Continuous Forms Printer Paper with a Medium Origin of X'01'

Presentation: **Portrait** Direction: **Down**

Medium Origin: X’04’

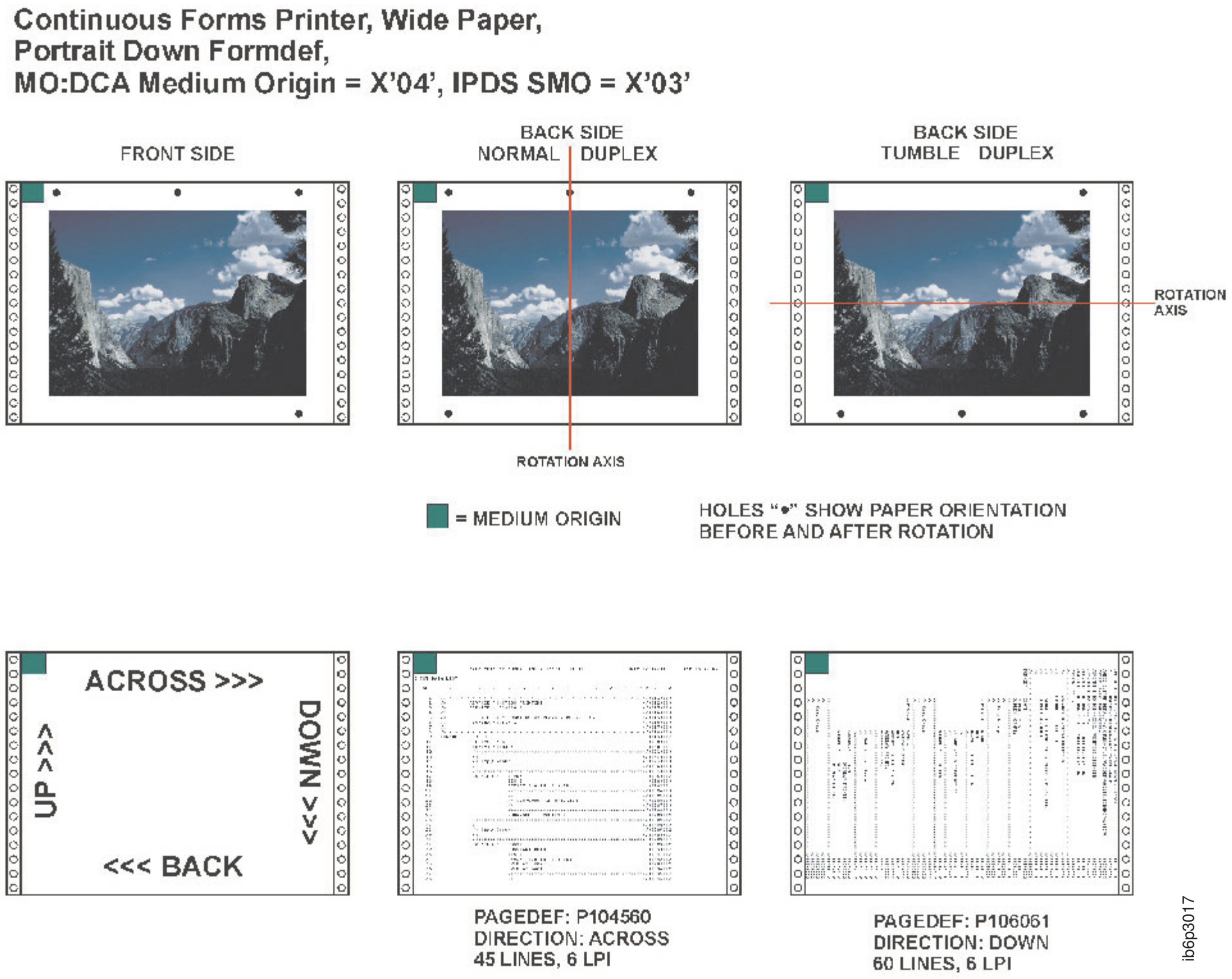


Figure 143. Wide Continuous Forms Printer Paper with a Medium Origin of X'04'

Presentation: Landscape Direction: Down

Medium Origin: X'05'

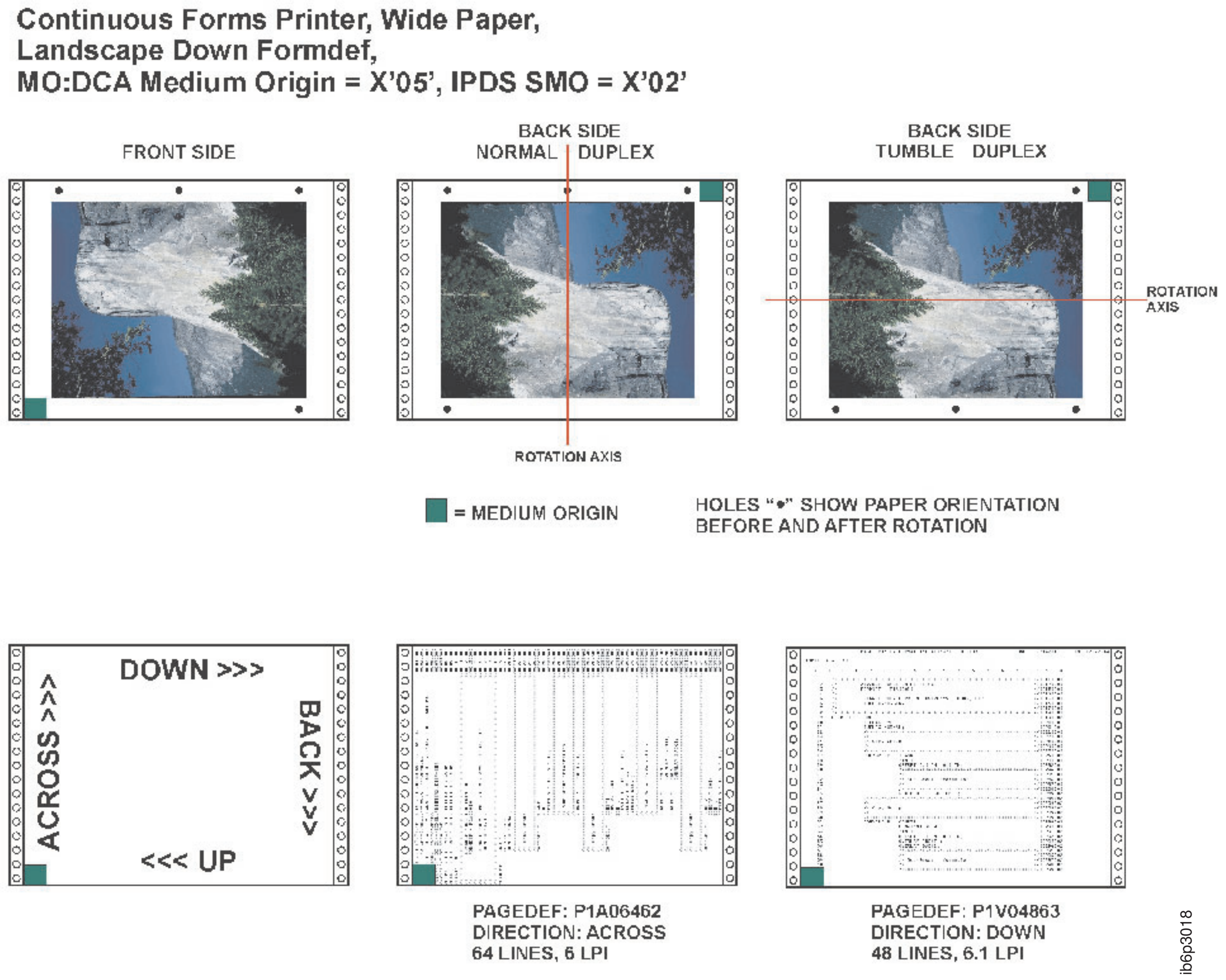


Figure 144. Wide Continuous Forms Printer Paper with a Medium Origin of X'05'

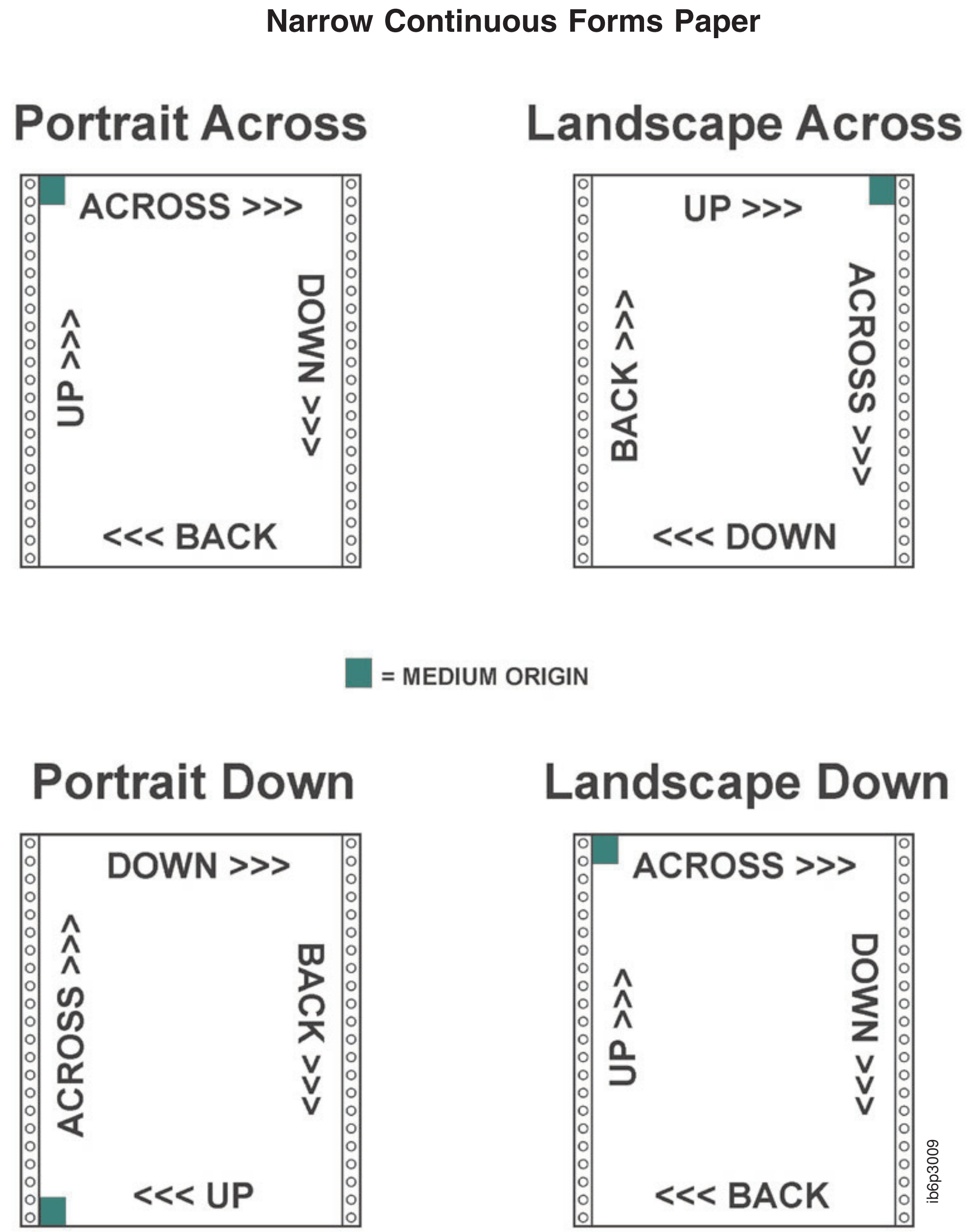


Figure 145. Narrow Continuous Forms Printer Paper Summary of Set Media Origin

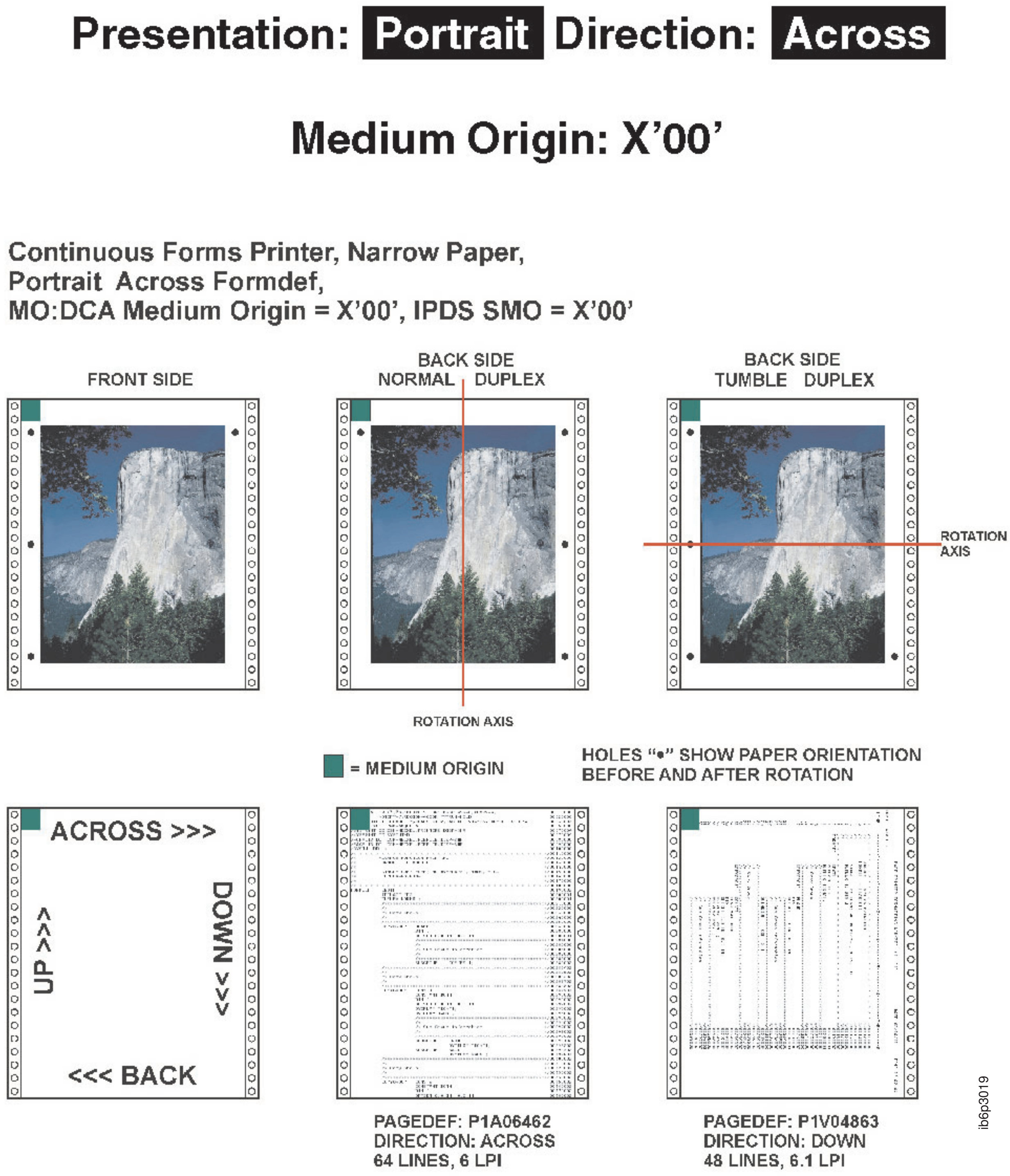


Figure 146. Narrow Continuous Forms Printer Paper with a Medium Origin of X'00'

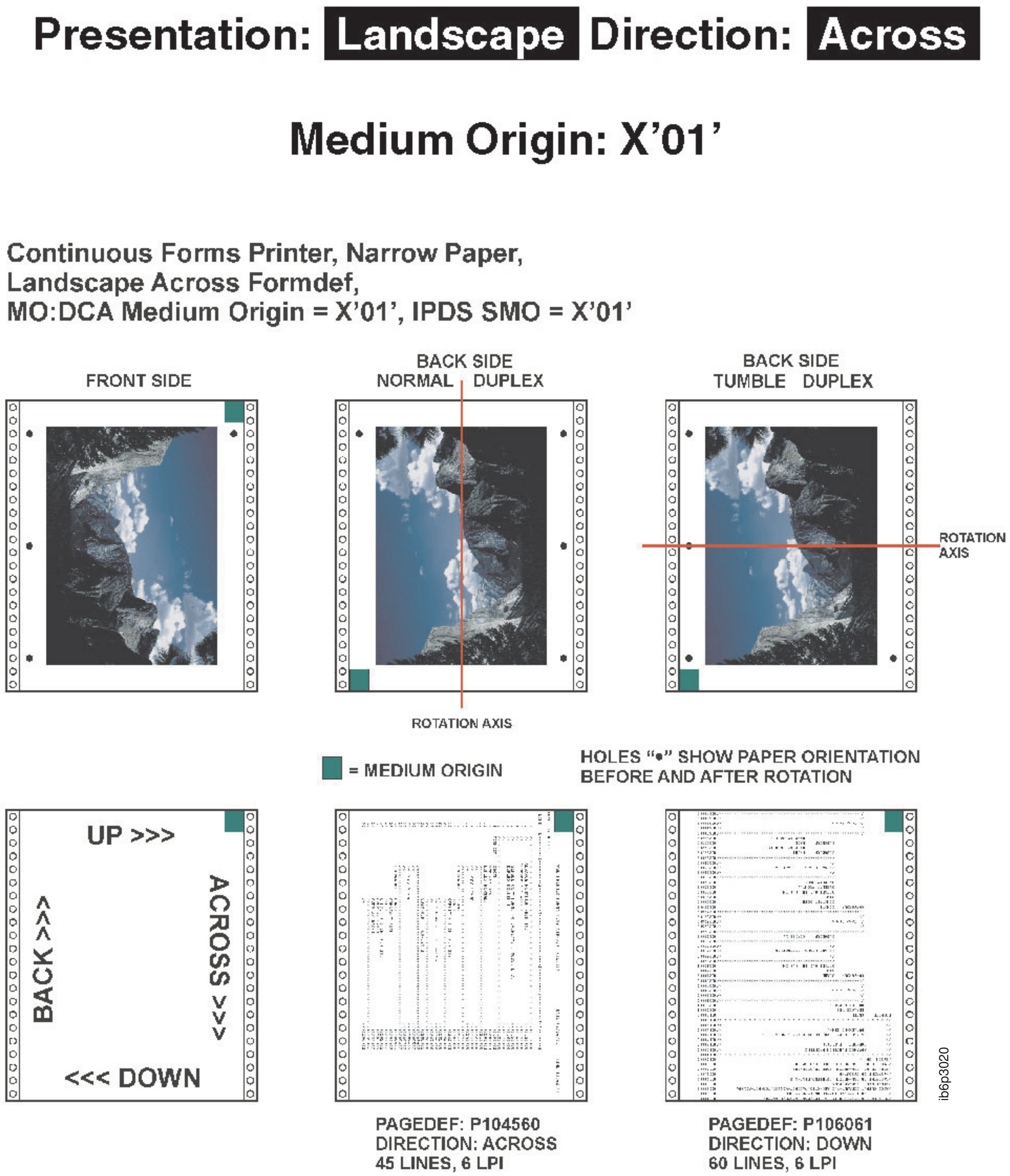


Figure 147. Narrow Continuous Forms Printer Paper with a Medium Origin of X'01'

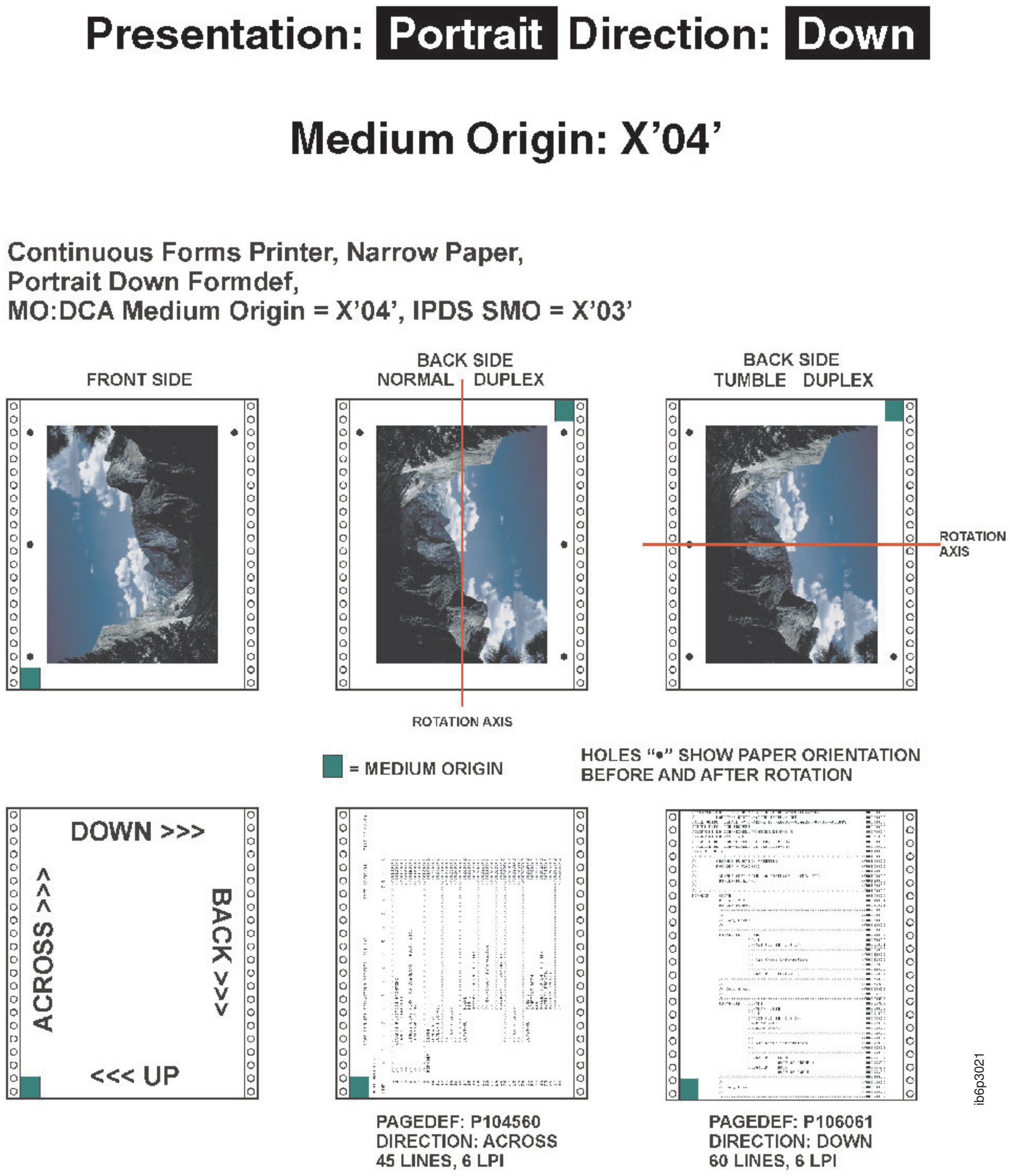


Figure 148. Narrow Continuous Forms Printer Paper with a Medium Origin of X'04'

Presentation: Landscape Direction: Down

Medium Origin: X’05’

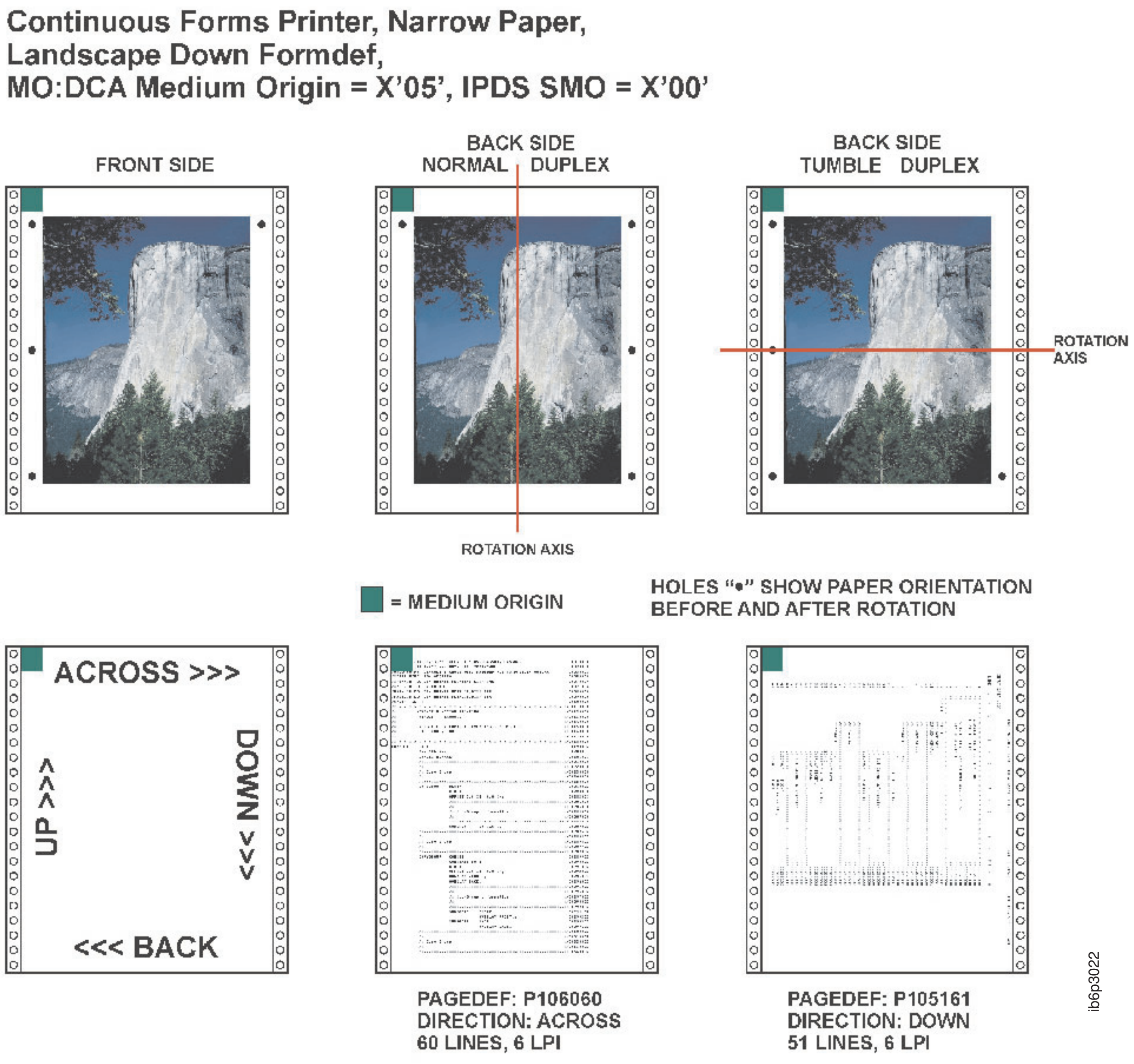


Figure 149. Narrow Continuous Forms Printer Paper with a Medium Origin of X'05'

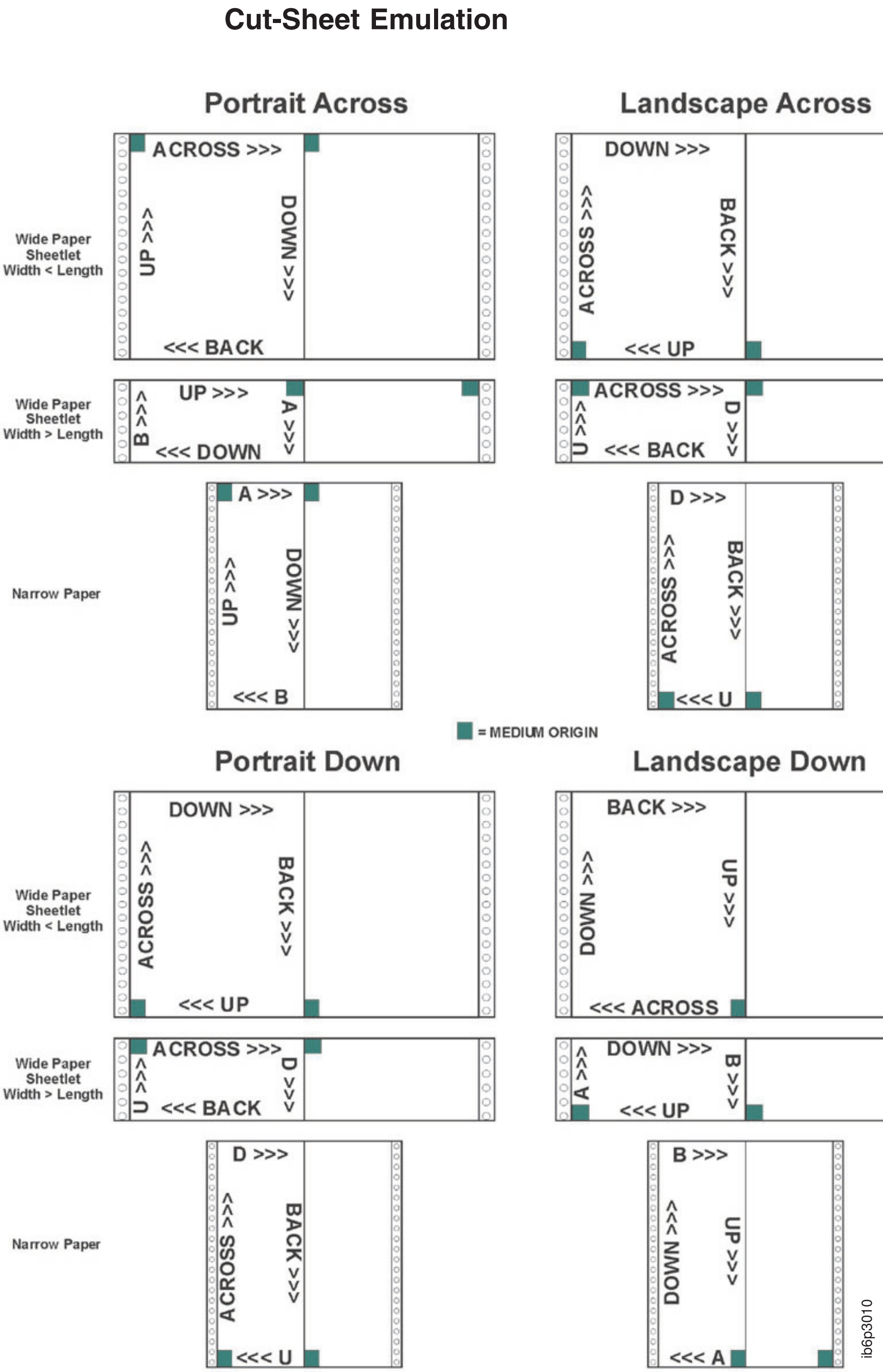


Figure 150. Cut-Sheet Emulation for Continuous Forms Printer Wide and Narrow Paper Set Media Origin

Appendix F. PPFA Keywords

A keyword is a word in PPFA that must be entered exactly as shown. Keywords cannot be used as second names for commands (like **FONT** and **OVERLAY**) which can have 2 positional parameters as names. This is less restrictive than prior versions of PPFA.

Note: When keywords are longer than five characters, they may be abbreviated to the first five characters. The shorthand form of the keyword must also be avoided as a name. For example, since **PAGEH** and **CONDI** are 5 character forms for **PAGEHEADER** and **CONDITION**, they cannot be used as second names.

The following is a list of PPFA reserved keywords:

ABSOLUTE
ACROSS
ADJUST
AFIELD
ALIGN
AXIS1
AXIS2
BACK
BARCODE
BCCOLOR
BCXPARMS
BIN
BINERROR
BODY
BOTH
BOX
BOXSIZE
CHANNEL
CIELAB
CIRCLE
CLRTRAP
CMR
CMRNAME
CMRTAGFIDELITY
CMYK
COLOR
COLORVALUERR
COMMENT
CONDITION
CONSTANT
COPIES
COPY
COPYGROUP
HRI
CP
CS
CUTSHEET
CVERROR
DBCS
DEFINE
DEFINE CMRNAME
DELIMITER
DIRECTION
DOWN
DOFONT
DRAWGRAPHIC
DUPLEX
ELLIPSE
ENDGRAPHIC
ENDSPACE
ENDSUBPAGE
EXTREF
FIELD
FILL
FINISH
FLASH
FLDNUM
FONT
FONTFID
FORMDEF
FRONT
GRAPHID
GRID
GROUP
GRPHEADER
HEIGHT
HILITE
HRIFONT
INVOKE
JOG
LAYOUT
LENGTH
LINE
LINEONE
LINESP
LINETYPE
LINEWT
MEDIUM
METRICTECHNOLOGY
METTECH
MOD
MODWIDTH
N
N_UP
NEWPAGE
NOGROUP
NOPRELOAD
NORASTER
OBID
OBJECT
OBKEEP
OBNOKEEP
OBTYPE
OBXNAME
OB2CMR
OB2ID
OB2RESOURCE
OB2TYPE
OB2XNAME
OCA
OFFSET
OPCOUNT
OPERATION
OPOFFSET
OPPOS
OTHERWISE
OUTBIN
OVERLAY
OVROTATE
PAGECOUNT
PAGEDEF
PAGEFORMAT
PAGEHEADER
PAGENUM
PAGETRAILER
PARTITION
PLACE
POSITION
PRELOAD
PRESENT
PRINTDATA
PRINTLINE
PROCESSING
QUALITY
RADIUS
RASTER
RATIO
RECID
REFERENCE
RELATIVE
RENDER
REPEAT
REPLACE
RES
RESOLUTION
RGB
ROTATION
SBCS
SCOPE
SEGMENT
SETUNITS
SOSIFONT
SPACE_THEN_PRINT
SSASTERISK
START
SUBGROUP
SUPPBLANKS
SUPPRESSION
TEXT
TEXTERROR
TO
TONERSAVER
TRCREF
TYPE
UDTYPE
WHEN
WIDTH
XATTR
XLAYOUT
XMSIZE
XSPACE
YMSIZE

Appendix G. PPFA Media Names

Table 32 lists the PPFA media names, media types, and component identifiers.

Note: The range of component ids from 12,288 to 268,435,455 is reserved for user defined media types.

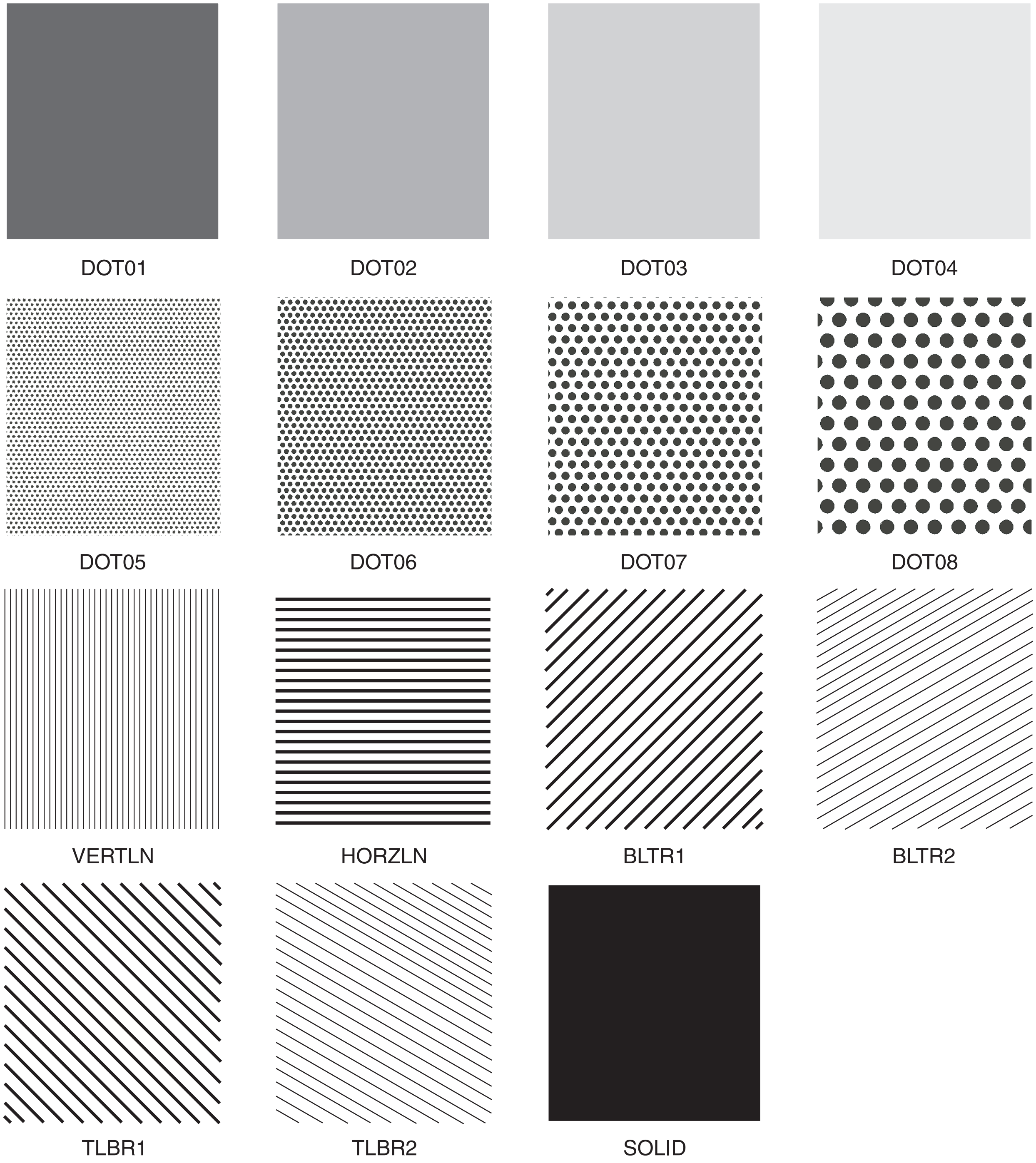
Table 32. Registered Media Types Sorted By Media Name

Media Name	Media Type	Component ID
BSNS ENV	North American business envelope	143
COM 10 ENV	Com10 envelope (9.5 x 4.125 in)	75
C5 ENV	C5 envelope (229 x 110 mm)	79
DL ENV	DL envelope (220 x 110 mm)	77
EXEC	North American executive (7.25 x 10.5 in)	65
INDEX CD	Index Card	150
ISO A3	ISO A3 white (297 x 420 mm)	10
ISO A3 CO	ISO A3 colored	11
ISO A4	ISO A4 white (210 x 297 mm)	0
ISO A4 CO	ISO A4 colored	1
ISO A4 TAB	ISO A4 tab (225 x 297 mm)	7
ISO A4 THD	ISO 1/3 A4	5
ISO A4 TR	ISO A4 transparent	2
ISO A5	ISO A5 white (148.5 x 210 mm)	20
ISO A5 CO	ISO A5 colored	21
ISO A6 PC	ISO A6 Postcard	152
ISO B4	ISO B4 white (257 x 364 mm)	30
ISO B4 CO	ISO B4 colored	31
ISO B4 ENV	ISO B4 envelope	83
ISO B5	ISO B5 white (176 x 250 mm)	40
ISO B5 CO	ISO B5 colored	41
ISO B5 ENV	ISO B5 envelope	73
ISO C4 ENV	ISO C4 envelope	93
ISO C5 ENV	ISO C5 envelope	103
ISO LNG ENV	ISO long envelope	113
JIS B4	JIS B4 (257 x 364 mm)	42
JIS B5	JIS B5 (182 x 257 mm)	43
JP PC	Japan postcard (Hagaki) (100 x 148 mm)	81
JP PC ENV	Japan postcard envelope (200 x 150 mm)	80
LEDGER	North American ledger (11 x 17 in)	67
LEGAL	North American legal white (8.5 x 14 in)	60
LEGAL CO	North American legal colored	61

Table 32. Registered Media Types Sorted By Media Name (continued)

Media Name	**Media Type**	**Component ID**
LEGAL TAB	Legal tab (9 x 14 in)	146
LEGAL 13	North American legal 13 (Folio) (8.5 x 14 in)	63
LETTER	North American letter white (8.5 x 11 in)	50
LETTER CO	North American letter colored	51
LETTER TAB	Letter tab (9 x 11 in)	145
LETTER TR	North American letter transparent	52
MON ENV	Monarch envelope (7.5 x 3.875 in)	76
RA3	Oversize A3 (16.923 x 12.007 in)	153
RA4	Oversize A4 (8.465 x 12.007 in)	162
STATEMNT	North American statement (5.5 x 8.5 in)	69
US PC	US Postcard	151
9x12 ENV	North American 9 x 12 envelope	133
10x13 ENV	North American 10 x 13 envelope	123
9x12 MAN	Manual (9 x 12 in)	147
8x10 MED	Media (8 x 10 in)	160
8x10.5 MED	Media (8 x 10.5 in)	148
8.5x10 MED	Media (8.5 x 10 in)	157
9x14 MED	Media (9 x 14 in)	149
12x18 MED	Media (12 x 18 in)	155
14x17 MED	Media (14 x 17 in)	154
14x18 MED	Media (14 x 18 in)	156

Appendix H. Fill Patterns for DRAWGRAPHIC Commands



DOT01 DOT02 DOT03 DOT04

DOT05 DOT06 DOT07 DOT08

VERTLN HORZLN BLTR1 BLTR2

TLBR1 TLBR2 SOLID

Figure 151. Fill Patterns for **DRAWGRAPHIC** *Commands*

Appendix I. PPFA Messages and Codes

At the end of processing for each command, the maximum error level encountered during processing is printed on the system printer, providing the error was not caused by the system printer itself. The meaning of the return codes is shown in Table 33.

Table 33. Return Codes

Return Code	Severity	Description
Return Code 0	I = Information; the command is processed.	PPFA did not encounter any problems. No warning, error, severe-error, or termination-error message was issued.
Return Code 4	W = Warning; the command is processed.	PPFA encountered at least one non-terminating error, solved by an assumption. At least one warning message was issued. No error, severe-error, or terminating-error message was issued. The requested function was probably correctly performed. The program executed to completion.
Return Code 8	E = Error; the command is partially processed.	PPFA encountered at least one error, but no severe or terminating error. A requested function may be partially incomplete.
Return Code 12	S = Severe error; the command is not processed.	PPFA encountered a severe error. The program executed to completion, but some of the functions requested were not performed.
Return Code 16	T = Termination error; the job is terminated.	PPFA encountered a terminating error. The program terminated prematurely.

PPFA Messages and Their Meanings

The general format of the error message is as follows:

All messages consist of a standard seven-character prefix, followed by the message text:

AKQnnnS THIS IS THE MESSAGE TEXT . . .
AKQ is the three-character identifier of Page Printer Formatting Aid for AIX (PPFA).
nnn is the message number.
S is the message-severity indicator. The indicators are defined in Table 33.

Note: You cannot use the **psfmsg** command to view PPFA messages.

In addition, PPFA errors are written to a listing file. AIX messages are written to standard error. Sometimes, AIX-specific errors mean that PPFA errors are not written to a listing file.

Note: PPFA issues a maximum of 269 user errors generated within a source file, and one additional message is used for the message queue to indicate an out-of-storage condition.

AKQ001E END OF COMMENT (*/) IS NOT SPECIFIED.

Explanation: The end mark of a comment (*/) is not specified.

System action: The page definition or form definition is not generated. The syntax check may be ended.

Operator response: Specify the end mark of a comment.

AKQ002E DBCS STRING DOES NOT END WITH SHIFT-IN.

Explanation: DBCS strings in comments must terminate with shift-in.

System action: The form definition or page definition is not generated. The syntax check continues, assuming shift-in.

Operator response: Specify a valid DBCS string enclosed by SO and SI.

AKQ003E LITERAL DOES NOT END WITH APOSTROPHE.

Explanation: A literal must end with an apostrophe.

System action: The page definition is not generated. The syntax check continues, assuming an apostrophe.

Operator response: Specify a valid literal enclosed by apostrophes. Note that an apostrophe in a literal is specified by consecutive double apostrophes.

AKQ004E DBCS LITERAL DOES NOT END WITH SHIFT-IN AND APOSTROPHE.

Explanation: A DBCS literal must end with shift-in and apostrophe.

System action: The page definition is not generated. The syntax check continues, assuming the end of the DBCS literal at the end of a record.

Operator response: Specify a valid literal ended by shift-in and apostrophe.

AKQ101E COMMAND SEQUENCE IS INVALID.

Explanation: The command sequence is invalid.

System action: A page definition or form definition is not generated. The syntax check continues from a valid command.

Operator response: Specify commands in a valid sequence.

AKQ102E INVALID COMMAND (*erroneous entry*) IS SPECIFIED.

Explanation: An invalid command is specified in the input data.

System action: A page definition or form definition is not generated. The syntax check continues from a valid command.

Operator response: Specify a valid command.

AKQ103E INVALID SUBCOMMAND (*value*) IS SPECIFIED.

Explanation: An invalid subcommand was specified in the input data. This message is often issued when a semicolon (;) is missing

System action: A page definition or form definition is not generated. The syntax check continues from the next keyword.

Operator response: Specify a valid subcommand.

AKQ104E (*command* or *parameter name*) NAME IS NOT SPECIFIED.

Explanation: The required name is not specified.

System action: A page definition or form definition is not generated. The syntax check continues, assuming blanks or default as the name.

Operator response: Specify the required name.

AKQ105E REQUIRED PARAMETER IN (*subcommand name*) IS NOT SPECIFIED.

Explanation: The subcommand indicated in the message requires a correct PPFA format.

System action: A page definition or form definition is not generated. The syntax check continues, assuming the default values.

Operator response: Refer to the command reference section of this publication for help in specifying a valid subcommand parameter.

AKQ106E (*command* or *parameter name*) NAME IS SPECIFIED WITH INVALID SYNTAX.

Explanation: The required name is specified with invalid syntax. See Table 8 on page 219 for the correct length of names.

System action: A page definition or form definition is not generated. The syntax check continues.

Operator response: Specify a valid name.

AKQ107E PARAMETER IN (*subcommand name*) IS INVALID.

Explanation: The parameter in the subcommand is invalid (invalid format or out of range).

System action: A page definition or form definition is not generated. The syntax check continues, assuming the default values as the parameter.

Operator response: Specify a valid parameter value.

AKQ108E (*subcommand name*) SUBCOMMAND IS DUPLICATED IN ONE COMMAND.

Explanation: The subcommand indicated in the message was specified more than once in the same command. Only one such subcommand is permitted within this command.

System action: A page definition or form definition is not generated. The syntax check continues, ignoring the duplicate subcommand.

Operator response: Delete one subcommand.

AKQ109E (subcommand name) SUBCOMMAND CONFLICTS WITH (*subcommand name*) SUBCOMMAND.

Explanation: One subcommand conflicts with another (FONT, PRINTLINE, FIELD, OPCOUNT, OPPOS)

System action: A page definition or form definition is not generated. The syntax check continues, ignoring the latter subcommand.

User response: Delete one of the subcommands.

AKQ110E THE VALUE OF THE (*command name*) SUBCOMMAND IS TOO LARGE OR TOO SMALL.

Explanation: The parameter in the subcommand is out of range.

IN	136.5
MM	3467.1
CM	346.7
POINTS	9828.0
PELS (L-units)	32760

These values are specified in:

FORMDEF N_UP OVERLAY *relative_xpos relative_ypos*

PAGEDEF PRINTLINE OVERLAY / SEGMENT *relative_xpos relative_ypos*

Note: The values specified for the CPI and LPI are set in the SETUNITS subcommand.

System action: No form definition or page definition is generated. PPFA continues syntax checking.

Operator response: Specify a valid parameter value.

AKQ111E SUBCOMMAND SEQUENCE IS INVALID: (*subcommand name*) OCCURS AFTER (*subcommand name*)

Explanation: For example, a WHEN subcommand occurs after an OTHERWISE subcommand in a CONDITION command.

System action: A page definition or form definition is not generated. The syntax check continues, ignoring the subcommand.

Operator response: Reorder or rewrite the conditions.

AKQ112E CONDITION COMMAND DOES NOT ALLOW '*' IN ITS START SUBCOMMAND.

Explanation: A relative position ('*', '* + *n*', or '* − *n*') was specified in a START subcommand of a CONDITION command.

System action: A page definition or form definition is not generated. The syntax check continues from the valid subcommand.

Operator response: Specify an absolute starting position.

AKQ113E MORE THAN ONE 'WHEN' SUBCOMMAND SPECIFIED THE CHANGE PARAMETER.

Explanation: More than one WHEN subcommand specified CHANGE for its field comparison.

System action: A page definition or form definition is not generated. The syntax check continues from the valid subcommand.

Operator response: Remove the extra subcommands specifying the CHANGE parameter.

AKQ114E NUMBER OF PARAMETERS EXCEED LIMIT FOR (*subcommand name*) SUBCOMMAND OR KEYWORD.

Explanation: The named subcommand/keyword in the messages limits the number of parameters that may be coded with a single subcommand or keyword. The number of parameters that can be coded with the named subcommand or keyword is defined in the command reference sections of this publication; see Chapter 10, "Form Definition Command Reference" and Chapter 11, "Page Definition Command Reference."

System action: The form definition is not generated. The syntax check continues from the valid subcommand.

Operator response: Remove the extra parameters.

AKQ115E REQUIRED PARAMETER(S) (PARM1, PARM2, ...) IN (COMMAND OR SUBCOMMAND) IS (ARE) NOT SPECIFIED.

Explanation: This is a generic message which indicates one or more missing parameters on a subcommand or command. For example a DRAWGRAPHIC BOX must have a BOXSIZE subcommand coded.

System action: A page or form definition is not generated.

Operator response: Provide the correct parameter(s) on the command or subcommand.

AKQ116E PARAMETER (PARM1) IN (COMMAND OR SUBCOMMAND) IS INVALID.

Explanation: This is a generic message which indicates that a parameter in a subcommand or command is invalid.

System action: A page or form definition is not generated.

Operator response: Provide the correct parameter on the command or subcommand.

AKQ117E PARAMETER (PARM1) IN (COMMAND OR SUBCOMMAND) IS DUPLICATED.

Explanation: This is a generic message which indicates that a parameter in a subcommand or command is coded more than once. For example, ...LINEWT LIGHT BOLD... shows two different line weights in the same subcommand.

System action: A page or form definition is not generated.

Operator response: Remove one of the parameters.

AKQ118E MUTUALLY EXCLUSIVE PARAMETERS ON THE (INSERT1) COMMAND OR SUBCOMMAND ARE DUPLICATED.

Explanation: A command or subcommand contains more than one mutually exclusive parameter. For example, the PAGECOUNT subcommand on the PAGEDEF command cannot have both STOP and CONTINUE coded.

System action: A page or form definition is not generated.

Operator response: Remove one of the parameters.

AKQ119E GRAPHICS-TYPE (BOX, LINE, CIRCLE, ELLIPSE) MUST IMMEDIATELY FOLLOW DRAWGRAPHIC.

Explanation: The DRAWGRAPHIC command must have the graphics type (BOX, LINE, CIRCLE, ELLIPSE) immediately following the command.

System action: A page or form definition is not generated.

Operator response: Code one of the graphics types.

AKQ120I UNKNOWN COMPONENT ID. PPFA WILL ASSUME IT IS SUPPORTED.

Explanation: PPFA allows the use of numeric component IDs when the object type is **OTHER** so that new **OTHER** object types can be supported without a new release of PPFA. This is one of them.

System action: A PAGEDEF will be generated.

Operator response: Insure that the object type component id is supported by your printer and PSF service level.

AKQ121W COMMAND SEQUENCE IS INVALID. A (*insert-1*) OCCURS BEFORE A (*insert-2*).

Explanation: For example, an overlay occurs outside a copygroup.

System action: A dummy copygroup will be created. This will be the first copygroup. The FORMDEF will be generated.

Operator response: Reorder the command statements.

AKQ122W THE (*insert-1*) IS TOO LONG. IT IS TRUNCATED TO (*insert-2*) BYTES.

Explanation: The input length of a parameter is exceeded. For example, the maximum length of a barcode Macro is 4096 bytes.

System action: Only the first (*insert-2*) bytes of a parameter will be used. Processing continues. A PAGEDEF will be generated.

Operator response: Use a shorter text parameter.

AKQ201E (*subcommand name*) SUBCOMMAND IS NOT SPECIFIED.

Explanation: The required subcommand is not specified.

System action: A page definition or form definition is not generated. The syntax check continues, assuming the default.

Operator response: Specify the required subcommand.

AKQ202E SPECIFIED (*command name*) NAME IS NOT DEFINED.

Explanation: A resource name (OVERLAY, SUPPRESSION, FONT, OBJECT, QTAG, or COLOR) is not defined.

System action: A page definition or form definition is not generated. The syntax check continues.

Operator response: Correct the name.

AKQ203W (*command name*) NAME IS DUPLICATED.

Explanation: The required name must be unique for OVERLAY, COPYGROUP, FONT, PAGEFORMAT, OBJECT, or SUPPRESSION.

System action: A page definition or form definition is generated.

Operator response: Specify a unique name.

AKQ204E (*object*) NAME IS DUPLICATED.

Explanation: The name must be unique (OVERLAY, COPYGROUP, FONT, PAGEFORMAT, SEGMENT).

System action: A page definition or form definition is not generated. The syntax check continues.

Operator response: Specify a unique name.

AKQ205E PAGEFORMAT (*pageformat name*) WAS NOT FOUND IN THIS PAGE DEFINITION.

Explanation: A WHEN or OTHERWISE subcommand of CONDITION specifies a PAGEFORMAT name not found in the page definition being processed.

System action: A page definition or form definition is not generated. The syntax check continues.

Operator response: Specify a *pageformat name* that is in the page definition.

AKQ206E CONDITION (*condition name*) HAS ALREADY BEEN DEFINED.

Explanation: A CONDITION command specifies LENGTH, WHEN, or OTHERWISE, and the condition with this condition name has already been defined by an earlier CONDITION command.

System action: A page definition is not generated. The syntax check continues.

Operator response: Define the condition only the first time it occurs.

AKQ210E THE RELATIVE POSITION VALUE EXCEEDS THE ALLOWED RANGE

System action: The value specified for the *relative x* position or *relative y* position on the N_UP subcommand (for an OVERLAY) or PRINTLINE command (for an OVERLAY or SEGMENT) exceeds the range of +32760 to −32760 L-units. For example, assuming the default of 240 pels per inch is being used, the values must be equal to, or less than the following:

IN	136.5
MM	3467.1
CM	346.7
POINTS	9828.0
PELS (L-units)	32760 (+ or −)
CPI	*
LPI	*

The value specified for CPI or LPI in the SETUNITS command will determine whether the value will exceed 32760 L-units.

System action: The page definition or form definition is not generated. The syntax check continues.

Operator response: Correct the *relative x* and *y* position values within the allowed range.

AKQ211E FRONT/BACK SIDE IS NOT SPECIFIED FOR DUPLEX.

Explanation: The SUBGROUP specified with BACK does not exist after the SUBGROUP specified with FRONT, or the SUBGROUP specified with FRONT does not exist before the SUBGROUP specified with BACK.

System action: A form definition is not generated. The syntax check continues.

Operator response: Specify subgroups for both sides.

AKQ212W PAPER SIDE IS SPECIFIED FOR SIMPLEX.

Explanation: A subgroup specified with BOTH, FRONT, or BACK is invalid with single-sided printing.

System action: A form definition is generated, ignoring the subcommand specifying the paper side.

User response: Either delete the subcommand that specified the paper side or specify DUPLEX.

AKQ213E LOGICAL PAGE POSITION EXCEEDS THE LIMIT.

Explanation: The logical page position specified by the OFFSET subcommand in the FORMDEF or COPYGROUP command exceeds the limits.

System action: A form definition is not generated. The syntax check continues.

Operator response: Correct the error.

AKQ214E MORE THAN 127 SUPPRESSIONS ARE SPECIFIED IN ONE FORMDEF.

Explanation: More than 127 suppressions are specified in one FORMDEF.

System action: A form definition is not generated. The syntax check continues.

Operator response: Correct the error.

AKQ215E MORE THAN 127 OVERLAYS ARE SPECIFIED IN ONE COPYGROUP.

Explanation: More than 127 OVERLAYs are specified in one copy group. PPFA can issue this message for an N_UP subcommand that specifies more than 127 overlays.

System action: No form definition is generated. The syntax check continues.

User response: Correct the error.

AKQ216E MORE THAN ONE RASTER OVERLAY IS SPECIFIED IN ONE COPYGROUP.

Explanation: More than one raster OVERLAY is specified in one copy group.

System action: A form definition is not generated. The syntax check continues.

Operator response: Correct the error.

AKQ217W LOGICAL PAGE POSITION FOR BACK SIDE OF PAGE SPECIFIED IN SIMPLEX PROCESSING

Explanation: The logical-page position specified by the OFFSET subcommand in a FORMDEF or COPYGROUP command for the back side of a page was specified, but simplex was specified in a COPYGROUP command.

System action: A form definition is generated, with the back side logical page position included, as if duplex had been specified. The syntax check continues.

Operator response: Correct the error by specifying duplex in the COPYGROUP command or remove the second set of coordinates in the OFFSET subcommand.

AKQ218E MORE THAN 255 COPIES ARE SPECIFIED IN ONE COPYGROUP.

Explanation: More than 255 copies are specified in a COPYGROUP.

System action: A form definition is not generated. The syntax check continues.

Operator response: Correct the error.

AKQ219E MORE THAN 127 SUBGROUPS ARE SPECIFIED IN ONE COPYGROUP.

Explanation: More than 127 subgroups are specified in a COPYGROUP.

System action: A form definition is not generated. The syntax check continues.

Operator response: Correct the error.

AKQ220E MORE THAN 8 OVERLAYS ARE SPECIFIED IN ONE SUBGROUP.

Explanation: More than eight overlays are specified in one SUBGROUP.

System action: A form definition is not generated. The syntax check continues.

Operator response: Correct the error.

AKQ221E MORE THAN 8 SUPPRESSIONS ARE SPECIFIED IN ONE SUBGROUP.

Explanation: More than eight suppressions are specified in one SUBGROUP.

System action: A form definition is not generated. The syntax check continues.

Operator response: Correct the error.

AKQ222W DIFFERENT NUMBERS OF COPIES ARE SPECIFIED FOR EACH SIDE OF DUPLEX.

Explanation: The number of copies for BACK side is not equal to those for FRONT side.

System action: A form definition is generated assuming the number of copies specified for front side.

Operator response: Check the number of copies.

AKQ223E LOGICAL PAGE POSITION FOR (*page side*) SIDE OF PAGE EXCEEDS THE LIMIT.

Explanation: The logical-page position specified by the OFFSET subcommand in a FORMDEF or COPYGROUP command exceeds the limit for the current side of the page.

System action: A form definition is not generated. The syntax check continues.

Operator response: Correct the positioning OFFSET parameter.

AKQ224E MORE THAN 254 OVERLAYS ARE SPECIFIED IN A PAGEFORMAT.

Explanation: The maximum number of OVERLAY commands is 254. PPFA can issue this message for the OVERLAY subcommand of the PRINTLINE command.

System action: A page definition is not generated. The syntax check continues.

User response: Specify a valid number of OVERLAY commands.

AKQ225E CONSTANT SUBCOMMAND PARAMETER (*parameter*) SPECIFIED IN SIMPLEX PROCESSING

Explanation: The BACK or BOTH parameter has been specified for the CONSTANT subcommand within simplex processing.

System action: A form definition is not generated. The syntax check continues.

Operator response: Correct this CONSTANT subcommand or indicate DUPLEX.

AKQ226E DIRECTION SUBCOMMAND ONLY ALLOWED WITH PRESENT SUBCOMMAND.

Explanation: The DIRECTION subcommand has been specified, but the PRESENT subcommand has not.

System action: A form definition is not generated. The syntax check continues.

Operator response: Either add the PRESENT subcommand or remove the DIRECTION subcommand.

AKQ227E THE ORIGIN OF THE RESOURCE (*name*) NAMED IN THE PRINTLINE COMMAND IS OFF THE LOGICAL PAGE.

Explanation: The relative position of the PRINTLINE overlay or segment named is off the logical page. The origin of the overlay or segment specified for the resource named in the N_UP subcommand is off the medium.

System action: The page definition that has the overlay or segment in question is not generated. PPFA continues the syntax check, ignoring the problem.

Operator response: Correct the *x*-position and *y*-position for the OVERLAY or SEGMENT subcommand.

AKQ228E THE ORIGIN OF THE OVERLAY (*overlay name*) NAMED IN THE (*command*) COMMAND IS OFF THE MEDIUM

Explanation: The resource position values will position the resource such that at least part of the resource will be off the medium (physical page).

System action: The form definition that has the overlay in question is not generated. PPFA continues the syntax check, ignoring the problem.

User response: Correct the relative x-position and relative y-position values for the OVERLAY named in the N_UP subcommand.

AKQ229W SUBGROUPS FOR FRONT AND BACK OF SAME SHEET USED DIFFERENT BINS.

Explanation: In your subgroup command you specified FRONT and BACK parameters. However, your COPYGROUP has different bins specified.

System action: A form definition is generated that specifies the bin used for the front side.

Operator response: Check the number of copies and correct the bin setting.

AKQ231E PRINTLINE OR LAYOUT IS NOT SPECIFIED.

Explanation: There is no PRINTLINE or LAYOUT command in the page format.

System action: A page definition is not generated. The syntax check continues.

Operator response: Specify either a PRINTLINE or LAYOUT command.

AKQ232E REQUIRED SUBCOMMAND TEXT OR LENGTH IS NOT SPECIFIED.

Explanation: A FIELD subcommand must have a TEXT or LENGTH subcommand.

System action: A page definition is not generated. The syntax check continues.

Operator response: Specify either a TEXT subcommand or a LENGTH subcommand.

AKQ233E THE LOGICAL PAGE SIZE IS TOO LARGE OR TOO SMALL.

Explanation: The specified page size is too large or too small. The page size must be from 1 to 32767 pels. The HEIGHT and WIDTH subcommands must have values between 1 and 32767 PELS, inclusive, or the same measurements expressed in other units.

System action: A page definition is not generated. The syntax check continues, assuming the defaults.

Operator response: Correct the error.

AKQ234E POSITION OF LINEONE EXCEEDS THE LOGICAL PAGE BOUNDARY.

Explanation: The TOP or MARGIN position specified by the LINEONE subcommand exceeds the logical page boundary. This error message is issued only if TOP or MARGIN is specified.

System action: A page definition is not generated. The syntax check continues.

Operator response: Specify a valid position value.

AKQ235E MORE THAN 127 SEGMENTS ARE SPECIFIED IN ONE PAGEFORMAT.

Explanation: More than 127 segments are specified in a single PAGEFORMAT command. PPFA can issue this message for the SEGMENT subcommand of the PRINTLINE command.

System action: No page definition is generated. The syntax check continues.

User response: Correct the error.

AKQ238E MORE THAN 127 FONTS ARE SPECIFIED IN ONE PAGEFORMAT.

Explanation: More than 127 fonts are specified in one PAGEFORMAT or the specified TRC number exceeds 126. PPFA counts each use of a font in more than one direction or rotation as a separate font.

System action: A page definition is not generated. The syntax check continues.

Operator response: Correct the error.

AKQ239E PRINT POSITION EXCEEDS THE LOGICAL PAGE BOUNDARY.

Explanation: The print position specified by POSITION subcommand exceeds the logical page boundary.

System action: A page definition is not generated. The syntax check continues.

Operator response: Correct the error.

AKQ240E NUMBER OF PRINTLINES, FIELDS, AND CONDITIONS EXCEEDS 65,535 IN ONE PAGEFORMAT.

Explanation: The total number of PRINTLINEs, FIELDs, and CONDITIONs exceeds 65,535 in one page format.

System action: A page definition is not generated. The syntax check continues.

Operator response: Reduce the number of PRINTLINEs, FIELDs, or CONDITIONs in the page format.

AKQ241E TOTAL LENGTH OF TEXT DATA EXCEEDS 65,534 BYTES.

Explanation: The total length of text may be up to 65,534 bytes.

System action: A page definition is not generated. The syntax check continues.

Operator response: Correct the error.

AKQ242E THE VALUE OF THE STARTING POSITION OF A RECORD IS TOO LARGE OR TOO SMALL.

Explanation: The START position of a record exceeds the maximum (65,535) or minimum (1) value.

System action: A page definition is not generated. The syntax check continues.

Operator response: Correct the error.

AKQ243E DBCS LENGTH IS NOT A MULTIPLE OF 2.

Explanation: The number of bytes of DBCS must be a multiple of two. This means that the value of the LENGTH parameter must be a multiple of two.

System action: A page definition is not generated. The syntax check continues.

Operator response: Specify a valid length or a valid DBCS.

AKQ244E INVALID CODE IS SPECIFIED IN THE TEXT.

Explanation: SBCS text must be within code range X'00' to X'FE'.

Valid double-byte character set (DBCS) codes are between X'41' and X'FE' for each byte. PPFA checks this range. Code X'4040' (blank) is the only exception. For example, the following are valid DBCS codes: X'4040', X'4141', X'41FE', X'FE41', X'FEFE'.

System action: A page definition is not generated. The syntax check continues.

Operator response: Specify a valid code.

AKQ245E HEXADECIMAL TEXT IS INVALID.

Explanation: Hexadecimal text is specified in an invalid format. Hexadecimal text must have an even length parameter and be in hexadecimal notation ('0' to 'F').

System action: A page definition is not generated. The syntax check continues.

Operator response: Specify valid hexadecimal text.

AKQ246E NULL LITERAL IS SPECIFIED.

Explanation: The literal has no string.

System action: A page definition is not generated. The syntax check continues.

Operator response: Specify a valid literal.

AKQ247E KANJI NUMBER TEXT IS INVALID.

Explanation: A Kanji number is specified in invalid format. Kanji number text must be a string of Kanji numbers delimited by commas. Each Kanji number must be a decimal number equal to a valid DBCS code, minus X'4000'.

System action: A page definition is not generated. The syntax check continues.

Operator response: Specify valid kanji number(s) in a valid format.

AKQ248E TEXT ATTRIBUTE CONFLICTS WITH FONT.

Explanation: SBCS font is specified for DBCS text (type G, K), or DBCS font is specified for SBCS text (type C).

System action: A page definition is not generated. The syntax check continues.

Operator response: Correct the error.

AKQ249E TEXT ATTRIBUTE CONFLICTS WITH TEXT TYPE.

Explanation: The literal type conflicts with text type. SBCS literal is specified as type G or X, and DBCS literal is specified as type C, X, or K.

System action: A page definition is not generated. The syntax check continues.

Operator response: Correct the error.

AKQ250E TRC NUMBER IS DUPLICATED.

Explanation: The specified TRC number is duplicated in one page format.

System action: A page definition is not generated. The syntax check continues.

Operator response: Correct the error.

AKQ251W SPECIFIED LENGTH IS SHORTER THAN THE TEXT AND WAS TRUNCATED.

Explanation: The LENGTH parameter of the TEXT subcommand is shorter than the length of the specified literal, which is truncated to a specified length.

System action: The operation continues, truncating the literal.

Operator response: Check the truncation.

AKQ252E TEXT IS NOT THE LENGTH SPECIFIED BY THE LENGTH SUBCOMMAND.

Explanation: The length of the comparison text in a WHEN or OTHERWISE subcommand of a CONDITION command is not equal to the length specified by the LENGTH subcommand of that CONDITION command.

System action: A page definition is not generated. The syntax check continues.

Operator response: Change the comparison text or the LENGTH parameter so that they match.

AKQ253E TEXT IN THE ‘WHEN’ SUBCOMMAND IS TOO LONG.

Explanation: Constant text in a WHEN subcommand of a CONDITION command is too long to fit into an 8150-byte CCP structured field.

System action: A page definition or form definition is not generated. The syntax check continues.

Operator response: Shorten the field to 8000 bytes or fewer, and shorten the comparison text accordingly.

AKQ254E (text type) LITERAL WAS EXPECTED BUT (text type) WAS FOUND.

Explanation: An SBCS literal occurs where a DBCS one was expected, or vice versa.

System action: A page definition or form definition is not generated. The syntax check continues.

Operator response: In a FIELD command, do not use a DBCS literal without specifying a DBCS font. In a CONDITION command, do not mix SBCS and DBCS literals in the comparison text of a single WHEN subcommand.

AKQ255E INVOKE SPECIFIES A SIDE FOR WHICH NO PLACE SUBCOMMANDS PUT DATA.

Explanation: The N_UP PLACE subcommand contains an error that makes it incompatible with the value specified in the INVOKE subcommand. Either INVOKE

BACK was specified, but PLACE *n* BACK was not specified, or INVOKE FRONT was specified, but PLACE *n* FRONT was not specified.

System action: No form definition is generated. Processing continues.

User response: Specify the same value (FRONT or BACK) for both the INVOKE and PLACE subcommands.

AKQ256E INCORRECT NUMBER OF PLACE SUBCOMMANDS.

Explanation: The required number of PLACE subcommands must be specified.

System action: No form definition is generated. Processing continues.

User response: When using N_UP PLACE subcommands with single-sided printing, the number of PLACE subcommands must equal the value specified on N_UP. When using duplex printing, the number of PLACE subcommands must equal two times the value specified on N_UP.

AKQ257W CONSTANT (*parameter*) FOUND WITH PLACE SUBCOMMAND.

Explanation: The CONSTANT (*parameter*) subcommand can not be specified when N_UP PLACE subcommands are specified.

System action: A form definition is generated without constant forms control. The syntax check continues.

User response: Delete the CONSTANT (*parameter*) from the FORMDEF or COPYGROUP command.

AKQ258W MORE THAN 122 OPERATION POSITIONS SPECIFIED FOR A FINISH OPERATION.

Explanation: More than 122 operation finishing positions are specified.

System action: A form definition will be generated with 122 finishing positions. All others will be ignored.

User response: Move extraneous operator position values.

AKQ259W OPCOUNT AND OPPOS VALUES SPECIFIED. OPCOUNT IGNORED.

Explanation: Both OPCOUNT and OPPOS are specified.

System action: A form definition is not generated.

Operator response: If OPCOUNT is specified, OPPOS is ignored. When using OPPOS for controlling the position of each operation on the operation axis, OPCOUNT is ignored.

AKQ260E (*insert-1*) not allowed with/on a (*insert-2*).

Explanation: This is a generic message which indicates a contextually incorrect combination of PPFA commands or subcommands. If this message indicates an action is not allowed with/on a CMR of this type, the processing mode is not valid for that type of CMR. LINK is valid only for device link (DL) CMRs and device link (DL) CMRs can only have processing mode LINK. Any other use of LINK processing mode results in error message AKQ260E.

System action: A page definition is not generated.

Operator response: Correct the incorrect parameter and rerun the job.

AKQ261E (*insert-1*) requires (*insert-2*).

Explanation: This is a generic message which indicates a missing PPFA command or subcommand.

System action: A page definition is not generated.

Operator response: Add the required parameter and rerun the job.

AKQ262E (*insert-1*) specifies a (*insert-2*) which is not a (*insert-3*).

Explanation: This is a generic message which indicates a contextually incorrect combination of PPFA commands or subcommands. For example that an ENDGRAPHIC command has specified or defaulted to a GRAPHID that does not match a floating DRAWGRAPHIC BOX or DRAWGRAPHIC LINE.

System action: A page definition is not generated.

Operator response: Correct the indicated problem.

AKQ263E (*insert-1*) exceeds (*insert-2*).

Explanation: This is a generic message which indicates an out of bound condition for some parameters. For example that a DRAWGRAPHIC CIRCLE is positioned off the logical page.

System action: A page definition is not generated.

Operator response: Correct the indicated problem.

AKQ264W (*insert-1*) is ignored (*insert-2*).

Explanation: This is a generic message which indicates that a contextually incorrect combination of PPFA commands or subcommands is clearly incorrect and is just ignored. For example, if a LINEONE subcommand was coded on a Record Format PAGEDEF (for example, one using LAYOUT), the LINEONE subcommand would just be ignored.

System action: A page definition is generated.

Operator response: No action necessary unless the result is not what you wanted.

AKQ265W (*insert-1*) exceeds (*insert-2*).

Explanation: This is a generic message which indicates an out of bound condition for some parameters which is not necessarily critical. For example, when a DRAWGRAPHIC CIRCLE is positioned outside the margin boundary but still on the logical page.

System action: A page definition is generated.

Operator response: No action necessary unless the result is not what you wanted.

AKQ266E PAGEDEF CONTAINS BOTH LAYOUT AND PRINTLINE COMMANDS.

Explanation: Lines are placed in a record format page definition using LAYOUT commands or in an XML page definition using XLAYOUT command, otherwise lines are placed with PRINTLINE commands. They cannot be mixed in the same page definition.

System action: A page definition is not generated.

Operator response: Remove either the LAYOUT, XLAYOUT, or PRINTLINE commands.

AKQ267E MORE THAN ONE DEFAULT PAGEHEADER OR PAGETRAILER IN A PAGEFORMAT.

Explanation: Only one LAYOUT DEFAULT PAGEHEADER or PAGETRAILER can be coded in a PAGEFORMAT.

System action: A page definition is not generated.

Operator response: Remove one of the duplicates.

AKQ268E SPECIFIED MARGINS FOR THIS PAGEFORMAT OVERLAP.

Explanation: Either the left margin is defined on or right of the right margin or the top margin is defined on or below the bottom margin.

System action: A page definition is not generated.

Operator response: Redefine the margins so that they do not overlap.

AKQ269E A RECORD FORMAT PAGEDEF REQUIRES AT LEAST ONE FONT DEFINITION.

Explanation: At least one font must be defined whether or not one is referenced.

System action: A page definition is not generated.

Operator response: Define a font.

AKQ270E PDF417 MACRO DATA BYTE (*insert-1*), CODEPOINT (*insert-2*) CANNOT BE TRANSLATED TO GLI 0 ENCODATION

Explanation: This is an ASCII barcode and all code points must ultimately end up as ASCII. The printer will translate EBCDIC code points if you tell it, but it will translate the Macro data as well as the regular data.

When EBCDIC TO ASCII translation is requested for a PDF417 barcode, and the PAGEDEF is being compiled on an ASCII platform, and there is macro data it will be in ASCII. You now have mixed data which cannot be translated. So PPFA must translate the ASCII macro data to EBCDIC so that both will be the same. The printer can now translate the data and print the barcode. Now, not all EBCDIC code points will translate to GLI0 and we have just found one.

System action: The PAGEDEF will not be generated.

Operator response: Make sure that all the PDF417 macro text will translate to good EBCDIC code points.

AKQ271E THE FONT TYPE AND USER DATA TYPE (UDTYPE) SPECIFIED CAUSES A DATA TRANSFORMATION THAT IS NOT SUPPORTED

Explanation: When the User's Data Type (UDType) and font encoding are different, the printer must translate your data to the encoding type of the font. For example, if the UDType is **UTF8** and the font is an ASCII font, then the printer would have to translate your data from UTF8 to ASCII. For this reason combinations are restricted to the following:

UDType of UTF8	Fonts can only be ASCII or UNICODE.
UDType of UTF16	Fonts can only be UNICODE.

System action: PAGEDEF is not generated.

User response: Chooses an appropriately encoded font.

AKQ275I (*insert-1*)

Explanation: This is a generic informational message. Variable text inserts are printed. Two examples are:

1. EXTERNAL OBJECT NAME IS DUPLICATED.
2. KEYWORD USED AS A NAME. CHECK NAME NOT OMITTED. PROCESSING CONTINUES.

System action: Compilation continues. This definition is generated and stored or replaced.

Operator response: Make sure that the situation warned against is desired. For example, that the keyword used as a name is not actually a missing name, or that the duplicated object name is intended.

AKQ2MMS NUMBER OF MESSAGES EXCEEDS THE 270 ALLOWED LIMIT. PROGRAM TERMINATES.

Explanation: PPFA allows only 269 messages, plus this one. When this limit is reached, the messages are printed and the program terminates.

System action: The program terminates.

Operator response: Correct the PPFA code for the messages issued and redo.

AKQ301I PAGE PRINTER FORMATTING AID ENDED, MAX RETURN CODE = (*max return code***).**

Explanation: This message accompanies the output listings of all form definitions and page definitions with the maximum return code for that particular object. Only when the return code is less than 8 is the object generated.

System action: None.

Operator response: None.

AKQ302I NO ERRORS FOUND IN (*resource name***) DEFINITION.**

Explanation: One definition is processed. No statements were flagged in this definition.

System action: This definition is generated, and stored or replaced.

Operator response: None.

AKQ303S NO CONTROL STATEMENT(S) ARE SPECIFIED IN INPUT DATA.

Explanation: There are no control statements in the input data.

System action: The operation terminates.

Operator response: Specify a valid PPFA command.

AKQ304S DEFINITION STATEMENT IS NOT SPECIFIED.

Explanation: There is no FORMDEF or PAGEDEF command in the system input command stream.

System action: The operation terminates.

Operator response: Specify valid definition commands.

AKQ305S THIS DEFINITION IS NOT STORED BECAUSE MEMBER ALREADY EXISTS.

Explanation: This form definition or page definition is not saved because a file with the same name already exists in the directory (REPLACE option is NO).

System action: A page definition or form definition is not generated. The syntax check continues to next definition.

Operator response: Check the specified form definition or page definition name, and specify REPLACE subcommand YES. Specify another form definition or page definition name.

AKQ311I FORMDEF (*form definition name***) IS GENERATED AND STORED. MAX RETURN CODE = (max return code).**

Explanation: The form definition is generated and stored.

System action: A form definition is generated.

Operator response: None.

AKQ312I FORMDEF (*command name***) IS GENERATED AND REPLACED. MAX RETURN CODE = (***max return code***).**

Explanation: The form definition is generated and is replaced. The maximum return code is listed.

System action: A form definition is generated.

Operator response: None.

AKQ313E FORMDEF (*form definition name***) IS NOT GENERATED. MAX RETURN CODE = (***max return code***).**

Explanation: The form definition is not generated because of an error. The error is indicated by another message.

System action: A form definition is not generated.

Operator response: Correct the error.

AKQ321I PAGEDEF (*page definition name***) IS GENERATED AND FILED. MAX RETURN CODE = (***max return code***).**

Explanation: The page definition is generated and stored.

System action: A page definition is generated.

Operator response: None.

AKQ322I PAGEDEF (*page definition name***) IS GENERATED AND REPLACED. MAX RETURN CODE = (***max return code***).**

Explanation: The page definition is generated and is replaced.

System action: A page definition is generated.

Operator response: None.

AKQ323E PAGEDEF (*page-definition name*) IS NOT GENERATED. MAX RETURN CODE = (*max return code*).

Explanation: The page definition is not generated because of an error. The error is indicated by another message.

System action: A page definition is not generated.

Operator response: Correct the error.

AKQ350T AN UNRECOVERABLE PROGRAM ERROR OCCURRED.

Explanation: There was an error in PPFA logic.

System action: The operation terminates.

Operator response: Use local problem-reporting procedures to report this message.

AKQ360E FONT COMMAND DOES NOT CONTAIN SUFFICIENT INFORMATION.

Explanation: The FONT command referred to does not contain enough information to generate a valid MCF. This is caused by having a CS parameter without a CP parameter, or vice versa.

System action: A page definition is not generated.

Operator response: Correct the referenced FONT command.

AKQ361E FONT COMMAND SPECIFIES CONFLICTING PARAMETERS.

Explanation: A FONT is specified in more than one way, only one of the following is allowed:

- Coded Font
- Character Set, Code Page pair (CS and CP parameters)
- GRID

System action: A page definition is not generated.

Operator response: Correct the referenced FONT command.

AKQ362E FONT RATIO SPECIFIED WITHOUT FONT HEIGHT.

Explanation: To scale a font, both the HEIGHT and RATIO **must** be specified. If a RATIO subcommand is found without a HEIGHT subcommand, the scaling information can not be calculated by PPFA.

System action: A page definition is not generated.

Operator response: Correct the referenced FONT command.

AKQ363W HEIGHT SPECIFIED, WIDTH IN GRID IGNORED.

Explanation: You have specified both a HEIGHT and GRID in the FONT command.

System action: None.

Operator response: Correct the referenced FONT command.

AKQ364E INVALID DIRECTION WITH RELATIVE PRINTLINE

Explanation: You specified an incorrect direction with the relative printline in your page definition source. The field direction must match the direction of the printline. The printline direction must be ACROSS.

System action: A page definition is not generated.

Operator response: Correct the referenced DIRECTION subcommand.

AKQ365W COLOR AND EXTENDED COLOR SPECIFIED

Explanation: Both COLOR and one of the extended color keywords (RGB, CMYK, HIGHLIGHT, CIELAB) was specified.

System action: Both requests are placed into the output resource. Output depends on printer function.

Operator response: If output does not print as expected, remove one of the specifications.

AKQ370E BARCODE NAME WAS NOT PREVIOUSLY DEFINED.

Explanation: You attempted to reference a barcode name that had not been previously defined.

System action: A page definition is not generated.

Operator response: Correct the referenced BARCODE subcommand of the FIELD command.

AKQ371E BARCODE NAME WAS PREVIOUSLY DEFINED.

Explanation: You attempted to define a barcode name that had been previously defined.

System action: A page definition is not generated.

Operator response: Correct the referenced BARCODE subcommand of the FIELD command.

AKQ372W BARCODE MODIFICATION UNDEFINED FOR TYPE GIVEN.

Explanation: You specified a modification for a bar code that is not defined for the type specified.

See Appendix D, “More About Bar Code Parameters,” on page 523 on page 523 for more information.

System action: A page definition is generated as specified. This is done so that, as new bar code types and modifications are introduced, you can create page definitions for them. However, you will receive this warning, because the specification could also be an error.

Operator response: Correct the referenced BARCODE subcommand of the FIELD command, if appropriate.

AKQ373W BARCODE TYPE IS UNDEFINED.

Explanation: You specified a bar code type that is not defined.

System action: A page definition is generated as specified. This is done so that, as new bar code types and modifications are introduced, you can create page definitions for them. However, you will receive this warning, because this specification could also be an error.

Operator response: Correct the referenced BARCODE subcommand of the FIELD command, if appropriate.

AKQ374W INVALID DATA LENGTH FOR SELECTED BARCODE TYPE AND MODIFICATION.

Explanation: You specified a data length for a defined barcode type and modification that is invalid for that combination of type and modification. When extra control characters are used as in the case of QRCode SOSI data, the data after translation might not exceed the limit.

See Appendix D, “More About Bar Code Parameters,” on page 523 for more information.

System action: A page definition is generated as specified. This is done so that, as new bar code types and modifications are introduced, you can create page definitions for them. However, you will receive this warning, because this specification could also be an error.

Operator response: Correct the referenced BARCODE subcommand of the FIELD command, if appropriate.

AKQ401E EXEC PARAMETER IS INVALID.

Explanation: The program parameter specification is invalid.

System action: A page definition or form definition is not generated. The syntax check continues.

Operator response: Specify a valid program parameter.

AKQ402T ERROR OCCURRED DURING ATTEMPT TO OBTAIN STORAGE

Explanation: conditions generate this message:

1. Exceeds the available size to hold the compiled data for the page definition and form definition.
2. Insufficient available disk space on the file system to write the output of the compiler.
3. Exceeds the limit of 269 user errors generated within a PPFA source file.

System action: The operation terminated.

Operator response:

1. Increase the region or VM program size.
2. Increase the size of the file system or specify a directory on another file system that has more disk space.
3. Fix the errors reported to this point and re-run PPFA.

AKQ403T ERROR OCCURRED DURING ATTEMPT TO FREE STORAGE.

Explanation: A system error occurred while PPFA attempted to free disk space at the end of an execution.

System action: The operation terminates.

Operator response: Use local problem-reporting procedures to report this message.

AKQ404T SYSIPT OPEN FAILURE.

Explanation: SYSIPT cannot be opened.

System action: The operation terminates.

Operator response: Assign a valid input data file.

AKQ405T INSUFFICIENT STORAGE TO EXECUTE PPFA.

Explanation: The region size is too small to execute PPFA.

System action: The operation terminates.

Operator response: Increase the region size available to the job.

AKQ410T (Librarian error message).

Explanation: The message describes a librarian error.

System action: The operation terminates.

Operator response: Contact a system programmer.

AKQ411T FORMDEF LIBRARY OPEN FAILURE.

Explanation: The FORMDEF library cannot be opened.

System action: The operation terminates.

Operator response: Assign a valid FORMDEF library.

AKQ412T FORMDEF LIBRARY I/O ERROR.

Explanation: An I/O error occurred during an attempted access of a form definition directory.

System action: The operation terminates.

Operator response: Check the permissions of the directory. If you do not have access, contact the owner of the directory. If this does not resolve the problem, contact a system programmer.

AKQ413T FORMDEF DIRECTORY CANNOT BE UPDATED.

Explanation: The FORMDEF member cannot be registered on the directory.

System action: The operation terminates.

Operator response: Contact a system programmer.

AKQ414T FORMDEF LIBRARY CLOSE FAILURE.

Explanation: A form definition directory cannot be closed.

System action: The operation terminates.

Operator response: Use local problem-reporting procedures to report this message.

AKQ415T PAGEDEF LIBRARY OPEN FAILURE.

Explanation: The PAGEDEF library cannot be opened.

System action: The operation terminates.

Operator response: Assign a valid PAGEDEF library.

AKQ416T PAGEDEF LIBRARY I/O ERROR.

Explanation: I/O error occurs during an attempted access of a page definition directory.

System action: The operation terminates.

Operator response: Check the permissions of the directory. If you do not have access, contact the owner of the directory. If this does not resolve the problem, contact a system programmer.

AKQ417T PAGEDEF DIRECTORY CANNOT BE UPDATED.

Explanation: A page definition file cannot be registered on the directory.

System action: The operation terminates.

Operator response: Contact a system programmer.

AKQ418T PAGEDEF LIBRARY CLOSE FAILURE.

Explanation: A page definition directory cannot be closed.

System action: The operation terminates.

Operator response: Use local problem-reporting procedures to report this message.

AKQ420T SYSTEM ERROR. ABEND CODE = (ABEND *code*).

Explanation: System forces PPFA to terminate abnormally.

System action: The operation terminates.

Operator response: Contact a system programmer. Refer to the documentation for your operating system.

AKQ421T FORMDEF LIBRARY IS FULL.

Explanation: The file system into which PPFA attempted to save the form definition is full.

System action: The operation terminates.

Operator response: Increase the size of the file system or specify a directory on a file system that has more disk space.

AKQ422T PAGEDEF LIBRARY IS FULL.

Explanation: The file system into which PPFA attempted to save the page definition is full.

System action: The operation terminates.

Operator response: Increase the size of the file system or specify a directory on a file system that has more disk space.

AKQ501T SYSIN OPEN FAILURE.

Explanation: The PPFA input source file cannot be opened.

System action: The operation terminates.

Operator response: Specify a valid input source file.

AKQ502T SPANNED RECORD OF SYSIN IS NOT SUPPORTED.

Explanation: The spanned record of the PPFA input source file is not supported.

System action: The operation terminates.

Operator response: Specify a valid input record format.

AKQ503T UNDEFINED LENGTH RECORD OF SYSIN IS NOT SUPPORTED.

Explanation: An undefined length record of PPFA input source file is not supported.

System action: The operation terminates.

Operator response: Specify a valid input record format.

AKQ504T LOGICAL RECORD LENGTH OF SYSIN EXCEEDS LIMIT.

Explanation: The logical record length of the PPFA input source file exceeds limit which is 100 bytes except for the OS/390 variable length which is 104 and AIX which is 254.

System action: The operation terminates.

Operator response: Correct the logical record length of the file.

AKQ510T FORMDEF/PAGEDEF LIBRARY OPEN FAILURE.

Explanation: The FORMDEF or PAGEDEF directory cannot be opened.

System action: The operation terminates.

Operator response: Specify a valid FORMDEF or PAGEDEF or check to make sure that the directory is correct.

AKQ511T I/O ERROR OCCURRED DURING (FORMDEF/PAGEDEF) DIRECTORY SEARCH. RETURN CODE = (*return code*) REASON CODE = (*reason code*)

Explanation: I/O error occurred while performing FIND function.

System action: The operation terminates.

Operator response: Contact a system programmer.

AKQ512T LOGICAL RECORD LENGTH OF FORMDEF/PAGEDEF EXCEEDS LIMIT.

Explanation: The logical record length exceeds maximum or minimum value.

System action: The operation terminates.

Operator response: Specify a filename that has a valid record length.

AKQ513T BLOCK SIZE OF FORMDEF/PAGEDEF EXCEEDS LIMIT.

Explanation: The block size exceeds maximum or minimum value.

System action: The operation terminates.

Operator response: Assign a filename that has a valid block size.

AKQ514T UNDEFINED LENGTH RECORD IS NOT SUPPORTED IN FORMDEF/PAGEDEF LIBRARY.

Explanation: An undefined length record is not supported in FORMDEF/PAGEDEF directory.

System action: The operation terminates.

Operator response: Assign a valid record format.

AKQ515T FIXED LENGTH RECORD IS NOT SUPPORTED IN FORMDEF/PAGEDEF LIBRARY.

Explanation: The fixed length record is not supported in the FORMDEF or PAGEDEF library.

System action: The operation terminates.

Operator response: Assign a valid record format.

AKQ516T NO CONTROL CHARACTER RECORD IS SUPPORTED IN FORMDEF/ PAGEDEF LIBRARY.

Explanation: No control character record is supported in FORMDEF/PAGEDEF directory.

System action: The operation terminates.

Operator response: Assign a valid record format.

AKQ517T NO SPACE IN FORMDEF/PAGEDEF DIRECTORY.

Explanation: No space was available in the FORMDEF directory or the PAGEDEF directory to add or replace the resource.

System action: The operation terminates.

Operator response: Increase the directory space or specify a directory on another file system that has more disk space.

AKQ518T I/O ERROR OCCURRED WHILE UPDATING FORMDEF/PAGEDEF DIRECTORY. RETURN CODE = (*return code*). REASON CODE = (*reason code*).

Explanation: A permanent I/O error was detected, or the specified data control block is not opened, or insufficient disk space exists to perform the write function.

System action: The operation terminates.

Operator response: Contact a system programmer.

AKQ519T I/O ERROR OCCURRED DURING WRITE.

Explanation: The error message is displayed.

System action: The operation terminates.

Operator response: Contact a system programmer.

AKQ520T SPANNED RECORD IS NOT SUPPORTED IN FORMDEF/PAGEDEF LIBRARY.

Explanation: The spanned record is not supported in the FORMDEF or PAGEDEF library.

System action: The operation terminates.

Operator response: Remove the SPAN attribute and assign a valid dataset.

AKQ522T BLOCK SIZE IS NOT SPECIFIED FOR FORMDEF/PAGEDEF DATA SET.

Explanation: A block size is not specified for FORMDEF/PAGEDEF data set.

System action: The operation terminates.

Operator response: Specify a BLKSIZE in the DD statement.

AKQ540T SYSTEM ABEND (*code*) OCCURRED IN PPFA PROCESS.

Explanation: A system ABEND (*code*) occurred in PPFA/OS/390 process. Termination processing was performed by the ESTAE macro instruction.

System action: The operation terminates.

Operator response: Contact a system programmer. Refer to System Messages for your operating system.

AKQ541T USER ABEND (*code*) OCCURRED IN PPFA/OS/390 PROCESS.

Explanation: A user ABEND (*code*) occurred in PPFA/OS/390 process. Termination processing was performed by the ESTAE macro instruction.

System action: The operation terminates.

Operator response: Use local problem-reporting procedures to report this message.

AKQ600T INPUT FILENAME NOT SPECIFIED.

Explanation: You did not specify an input filename.

System action: The operation terminates.

Operator response: Enter the input filename.

AKQ601T INPUT FILETYPE NOT SPECIFIED.

Explanation: You did not specify an input filetype.

System action: The operation terminates.

Operator response: Enter the input filetype.

AKQ602T COMMAND SYNTAX IS NOT VALID.

Explanation: The command syntax you entered was not accepted.

System action: The operation terminates.

Operator response: Enter a valid command.

AKQ603T FILEMODE FOR (FORMDEF/PAGEDEF/LISTING) IS INVALID.

Explanation: You entered an invalid filemode for FORMDEF, PAGEDEF, or LISTING.

System action: The operation terminates.

Operator response: Enter a valid file extension.

AKQ604T INVALID PARAMETER IS SPECIFIED IN (FORMDEF/PAGEDEF/LISTING/SIZE) OPTION.

Explanation: You entered an invalid parameter for FORMDEF, PAGEDEF, LISTING, or SIZE.

System action: The operation terminates.

Operator response: Enter a valid option parameter.

AKQ605T (FORMDEF/PAGEDEF/LISTING/SIZE) KEYWORD IS DUPLICATED.

Explanation: You entered a duplicate keyword for FORMDEF, PAGEDEF, LISTING, or SIZE.

System action: The operation terminates.

Operator response: Enter a unique keyword.

AKQ606T FILETYPE FOR (FORMDEF/PAGEDEF/LISTING) NOT SPECIFIED.

Explanation: The filetype for FORMDEF, PAGEDEF, or LISTING was not entered.

System action: The operation terminates.

Operator response: Enter an appropriate filetype.

AKQ607T INVALID KEYWORD SPECIFIED.

Explanation: The keyword you entered was not accepted.

System action: The operation terminates.

Operator response: Enter a valid keyword.

AKQ608T INVALID SIZE PARAMETER SPECIFIED.

Explanation: The size parameter specified is not valid.

System action: The operation terminates.

Operator response: Enter a valid size parameter.

AKQ610T SIZE PARAMETER VALUE EXCEEDS THE ALLOWABLE MAXIMUM.

Explanation: The size entered exceeds the maximum allowable.

System action: The operation terminates.

Operator response: Enter a valid size value.

AKQ611T SIZE PARAMETER VALUE IS TOO SMALL.

Explanation: The size entered is too small for executing in PPFA/VM.

System action: The operation terminates.

Operator response: Enter a valid size value.

AKQ612T INVALID FILE IDENTIFIER '*' SPECIFIED FOR INPUT FILE.

Explanation: '*' is specified for input filename or filetype.

System action: The operation terminates.

Operator response: Enter a valid filename or filetype.

AKQ613T SIZE PARAMETER VALUE IS MISSING.

Explanation: You did not specify a size parameter

System action: The operation terminates.

Operator response: Specify a valid size parameter.

AKQ620T INPUT FILE WAS NOT FOUND.

Explanation: The input filename entered was not found.

System action: The operation terminates.

Operator response: Correct the input filename.

AKQ621T NO READ/WRITE (file mode) DISK ACCESSED FOR (INPUT/LISTING/ FORMDEF/PAGEDEF /OUTPUT).

Explanation: The disk on which the file is saved cannot be read from or written to because it either was not accessed or was accessed using an invalid access mode.

System action: The operation terminates.

Operator response: Access the file system using a valid access mode.

AKQ622T INPUT FILE EXCEEDS THE ALLOWABLE LOGICAL RECORD LENGTH MAXIMUM.

Explanation: The logical record length of the input file exceeds the limit which is 100 bytes except the OS/390 variable record length is 104 and AIX is 254.

System action: The operation terminates.

Operator response: Correct the logical record length of the file.

AKQ624T I/O ERROR OCCURRED IN (AKQINIO/AKQLBIO/AKQPRIO) MODULE. RC = (*return code* from FWRITE/FGETS *macro instruction*).

Explanation: An I/O error occurred during either FGETS or FWRITE processing of module AKQINIO, AKQLBIO, or AKQPRIO.

System action: The operation terminates.

Operator response: Contact your system programmer. Refer to the return code in *AIX Operating System Messages*

AKQ625T DISK (*file mode*) IS FULL.

Explanation: Not enough space is available on the specified file system to write the file.

System action: The operation terminates.

Operator response: Erase some files from the specified file disk and re-execute.

AKQ639T ABEND EXIT ROUTINE FAILED TO EXECUTE. RC = (*return code* from ABNEXIT *macro*)

Explanation: ABEND exit routine cannot be established.

System action: The operation terminates.

Operator response: Contact your system programmer. Refer to the return code in *AIX Operating System Messages*

AKQ640T SYSTEM ABEND (*code*) OCCURRED IN PPFA/VM PROCESS.

Explanation: A system ABEND occurred during processing. The ABEND exit routine ended processing.

System action: The operation terminates.

Operator response: Use local problem-reporting procedures to report this message.

AKQ641T USER ABEND (*code*) OCCURRED IN PPFA/VM PROCESS.

Explanation: A user-initiated ABEND occurred during processing. The ABEND exit routine ended the processing.

System action: The operation terminates.

Operator response: Use local problem-reporting procedures to report this message.

AKQ700I SIZE PARAMETER IS NO LONGER NECESSARY IN PPFA/370.

Explanation: The storage required to contain the messages and control blocks is not automatically set at 32K and 128K respectively. If the control block storage is used up, an additional 128K will be gotten and chained to the previous. All storage necessary to perform the compile will be obtained during processing.

System action: The compile process continues.

Operator response: None.

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Glossary

This glossary defines technical terms and abbreviations used in PSF for z/OS documentation. If you do not find the term you are looking for, view the IBM terminology website:

`http://www.ibm.com/software/globalization/terminology/`

These cross-references are used in this glossary:

- **Contrast with.** This refers to a term that has an opposed or substantively different meaning.
- **See.** Refers to preferred synonyms or to defined terms for acronyms and abbreviations.
- **See also.** Refers to related terms that have similar, but not synonymous, meanings, or to contrasted terms that have opposite or substantively different meanings.
- **Synonym for.** This indicates that the term has the same meaning as a preferred term, which is defined in its proper place in the glossary.
- **Synonymous with.** This is a backward reference from a defined term to all other terms that have the same meaning.

A

ACIF. (1) AFP conversion and indexing facility. (2) A print server utility program that converts a print file into AFP, MO:DCA-P, creates an index file for input data, and collects resources used by an AFP document into a separate file.

Advanced Function Presentation. A set of licensed programs, together with user applications, that use the all-points-addressable concept to print data on a wide variety of printers or to display data on a variety of display devices. AFP includes creating, formatting, archiving, retrieving, viewing, distributing, and printing information

AFP. Advanced Function Presentation.

AIX operating system. IBM's implementation of the UNIX operating system. The RS/6000®© system, among others, runs the AIX operating system.

all-points addressability. The capability to address, reference, and position data elements at any addressable position in a presentation space or on a physical medium. An example of all points addressability is the positioning of text, graphics, and images at any addressable point on the physical medium. See also *picture element*.

all-points-addressable mode. Synonym for *page mode*.

alphanumeric string. A sequence of characters consisting solely of the letters a through z and the numerals 0 through 9.

American National Standards Institute (ANSI). An organization consisting of producers, consumers, and general interest groups. ANSI establishes the procedures by which accredited organizations create and maintain voluntary industry standards in the United States. It is the United States constituent body of the International Organization for Standardization (ISO).

ANSI. See *American National Standards Institute*.

APA. All points addressable.

application. (1) The use to which an information system is put. (2) A collection of software components used to perform specific types of work on a computer.

application program. A program written for or by a user that applies to the user's work.

ascender. The parts of certain lowercase letters, such as b, d, or f, which at zero-degree character rotation rise above the top edge of other lowercase letters such as a, c, and e. Contrast with *descender*.

aspect ratio. The ratio of the length (or height) of a bar to the length (or width) of the linear bar code symbol.

attribute. A property or characteristic of one or more constructs. For example, *character attribute*, *color attribute*, *current drawing attributes*, *default drawing attributes*, *line attributes*, *marker attributes*, and *pattern attributes*.

B

bar. In bar codes, the darker element of a printed bar code symbol.

bar code. An array of parallel rectangular bars and spaces that together represent data elements or characters of a particular type. The bars and spaces are arranged in a predetermined pattern following unambiguous rules defined by the symbology.

bar code command set. In the IPDS architecture, a collection of commands used to present bar code symbols in a page, page segment, or overlay.

bar code density. The number of characters per inch (cpi) in a bar code symbology. In most cases, the range is three to ten cpi.

bar code object area. The rectangular area on a logical page into which a bar code presentation space is mapped.

Bar Code Object Content Architecture (BCOCA). An architected collection of constructs used to interchange and present bar code data.

bar code symbol. A combination of characters including start and stop characters, quiet zones, data characters, and check characters required by a particular bar code type, that form a complete, scannable entity.

bar code symbology. A bar code language. Bar code symbologies are defined and controlled by various industry groups and standards organizations. Bar code symbologies are described in public domain bar code specification documents. Synonymous with *symbology*. Examples of bar code symbology include: *Canadian Grocery Product Code (CGPC)*, *European Article Numbering (EAN)*, *Japanese Article Numbering (JAN)*, and *Universal Product Code (UPC)*.

bar height. In bar codes, the bar dimension perpendicular to the bar width. Synonymous with *bar length* and *height*.

bar length. In bar codes, the bar dimension perpendicular to the bar width. Synonymous with *bar length* and *height*.

bar width. In bar codes, the thickness of a bar measured from the edge closest to the symbol start character to the trailing edge of the same bar.

baseline. A conceptual line with respect to which successive characters are aligned.

baseline direction. The direction in which successive lines of text appear on a logical page.

bearer bars. A bar across the top and bottom edge of a linear bar code. Partial scans of bar code symbologies, such as Interleaved 2 of 5, can produce valid, but incorrect, reads by self-discriminating scanners. Bearer bars help prevent such errors and increase reliability.

Note: A self-discriminating scanner is one that automatically determines which bar code symbology it is reading.

BCOCA. See *Bar Code Object Content Architecture*.

bin. The standard-size paper source on cut-sheet page printers that have more than one paper source. Each printer is set up with either A4 or letter-size paper as the standard size. Contrast with *cassette*.

BITS. A data type for architecture syntax, indicating one or more bytes to be interpreted as bit string information.

body. (1) On a printed page, the area between the top and bottom margins that can contain data. (2) In a book, the portion between the front matter and the back matter.

boldface. (1) A heavy-faced type. (2) Printing in heavy-faced type.

C

carriage control character. If present, the first character of an output record (line) that is to be printed or spaced; it determines how many lines should be skipped before the line.

cassette. A removable storage device that is the source for alternate sizes of paper on page printers that have more than one paper source. Contrast with *bin*.

CDB2OF7. A parameter that specifies a bar code type of Codabar, 2-of-7, Automatic Identification Manufacturers Uniform Symbol Specification-Codabar.

CGPC. See *Canadian Grocery Product Code*.

CHAR. A data type for architecture syntax, indicating one or more bytes to be interpreted as character information.

character. (1) A member of a set of elements used for the organization, control, or representation of data. A character can be either a graphic character or a control character. (2) In bar codes, a single group of bars and spaces that represent an individual number, letter, punctuation mark, or other symbol.

character ascender. See *ascender*.

character attribute. A characteristic that controls the appearance of a character or character string.

character baseline. A conceptual reference line that is coincident with the X axis of the character coordinate system.

character code. An element of a code page or a cell in a code table to which a character can be assigned. The element is associated with a binary value. The assignment of a character to an element of a code page determines the binary value that will be used to represent each occurrence of the character in a character string.

character descender. See *descender*.

character identifier. The unique name for a graphic character.

character rotation. The alignment of a character with respect to its character baseline, measured in degrees in a clockwise direction. Examples are 0°, 90°, 180°, and 270°. Zero-degree character rotation exists when a character is in its customary alignment with the baseline. Character rotation and font inline sequence are related in that character rotation is a clockwise rotation; font inline sequence is a counterclockwise rotation.

character set. A finite set of different graphic or control characters that is complete for a given purpose. For example, the character set in ISO Standard 646, *7-bit Coded Character Set for Information Processing Interchange*

character set attribute. An attribute used to specify a coded font.

check character. The result of some mathematical combination of the characters in the field being bar coded. Used as a check of the accuracy of both the input of the data field and the scanning of the bar code. A bar code can have 0, 1, 2, or sometimes more check characters.

check digit. Same as a check character, but limited to decimal digits only.

code page. (1) A resource object containing descriptive information, graphic character identifiers, and code points corresponding to a coded graphic character set. Graphic characters can be added over time; therefore, to specifically identify a code page, both a GCSGID and a CPGID should be used. See also *coded graphic character set*. (2) A set of assignments, each of which assigns a code point to a character. Each code page has a unique name or identifier. Within a given code page, a code point is assigned to one character. More than one character set can be assigned code points from the same code page.

Code Page Global Identifier (CPGID). A unique code page identifier that can be expressed as either a two-byte binary or a five-digit decimal value.

code point. A unique bit pattern that can serve as an element of a code page or a site in a code table, to which a character can be assigned. The element is associated with a binary value. The assignment of a character to an element of a code page determines the binary value that will be used to represent each occurrence of the character in a character string. Code points are one or more bytes long.

Code39. A bar code symbology characterized by a variable-length, bidirectional, discrete, self-checking, alphanumeric code. Three of the nine elements are wide and six are narrow. It is the standard for LOGMARS (the Department of Defense) and the AIAG.

Code128. A bar code symbology characterized by a variable-length, alphanumeric code with 128 characters.

Codabar. A bar code symbology characterized by a discrete, self-checking, numeric code with each character represented by a standalone group or four bars and three spaces between them.

coded font. (1) A resource containing elements of a code page and a font character set, used for presenting text, graphics character strings, and bar code HRI. See also *code page* and *font character set*. (2) In FOCA, a resource containing the resource names of a valid pair of font character set and code page resources. The graphic character set of the font character set must match the graphic character set of the code page for the coded font resource pair to be valid. (3) In the IPDS architecture, a raster font resource containing code points that are directly paired to font metrics and the raster representation of character shapes, for a specific graphic character set. (4) In the IPDS architecture, a font resource containing descriptive information, a code page, font metrics, and a digital-technology representation of character shapes for a specific graphic character set.

Coded Graphic Character Set Global Identifier (CGCSGID). A four-byte binary or a ten-digit decimal identifier consisting of the concatenation of a GCSGID and a CPGID. The CGCSGID identifies the code point assignments in the code page for a specific graphic character set, from among all the graphic characters that are assigned in the code page.

color attribute. An attribute that affects the color values provided in a graphics primitive, a text control sequence, or an IPDS command. Examples of color attributes are foreground color and background color.

color model. The method by which a color is specified. For example, the RGB color space specifies color in terms of three intensities for red (R), green (G), and blue (B).

command. A request for performance of an operation or execution of a program. In Page Printer Formatting Aid, commands are control statements for major formatting functions. For example, FORMDEF and COPYGROUP are commands. Commands are further specified by subcommands and parameters.

command stream. The sequence of Page Printer Formatting Aid commands that is submitted with the job control statements in a Page Printer Formatting Aid execution. The commands and subcommands are the control statements that define the object or objects to be generated.

compatibility mode. Use of Table Reference Characters (TRCs) that are acceptable to line printers and page printers and that access page definitions with little or no change to the user's data or to the job command stream. Contrast with *page mode*.

composed-text data file. A file containing text data and text control information that dictates the format, placement, and appearance of the data to be printed.

conditional processing. A page definition function that allows input data records to partially control their own formatting.

construct. An architected set of data such as a structured field or a triplet.

continuous code. A linear bar code in which each character starts immediately after the preceding character. There is no space or gap between characters. Interleaved 2 of 5 is an example of a continuous bar code.

control character. (1) A character that denotes the start, modification, or end of a control function. A control character can be recorded for use in a subsequent action, and it can have a graphic representation. See also *character*. (2) A control function the coded representation of which consists of a single code point.

copy group. A subset of a form definition containing a set of controls for the physical pages of a printout. Such functions as the selection of either of two paper sources on the page printer, the use of duplex printing, or the positioning of the reference point for all printing on the sheet are available in the copy group.

cm. Centimeters.

CMS. Conversational Monitor System.

cpi. Characters per inch.

cut-sheet media. Unconnected sheets. Contrast with *continuous-form media*.

D

data map. An internal object whose structured fields control the formatting of data on a logical page of a printout. Created by a PAGEDEF command or a PAGEFORMAT command.

data stream. A continuous stream of data that has a defined format. An example of a defined format is a structured field.

DBCS. Double-byte character set.

default. Pertaining to an attribute, value, or option that is assumed when none is explicitly specified and one is needed to continue processing.

density. A measure of the number of characters per inch or per millimeter represented by the bar code. A high-density bar code represents more characters per inch than a low-density bar code. The bar code symbology helps determine the density. Within a given symbology, factors that affect the density of a bar code are: the x-dimension (width of the narrow bar) and the wide-to-narrow ratio (width of a wide bar relative to the narrow bar).

descender. In a font, the distance from the baseline to the bottom of the character box. This value may differ for different characters in a given font. Contrast with *ascender*.

direction. The print position of data in a logical page, line, or field. In Page Printer Formatting Aid, the ultimate reference point for all direction controls on a page is the hardware origin. Secondary and tertiary reference points are possible as well, allowing more than one print direction on a page.

discrete code. A linear bar code constructed with groups of bars and spaces representing individual characters and having a space or intercharacter gap between each group. This gap is used solely to separate characters and contains no data. Code 3 of 9 is a discrete bar code.

document. (1) A machine-readable collection of one or more objects that represents a composition, a work, or a collection of data. (2) A publication or other written material.

double-byte character set (DBCS). A character set, such as a set of Japanese ideographs, requiring two bytes to identify each character.

duplex printing. Printing on both sides of a sheet.

E

EAN. See *European Article Numbering*.

EAN2SUP. A parameter that specifies a bar code type of European Article Numbering, Two-digit Supplemental.

EAN5SUB. A parameter that specifies a bar code type of European Article Numbering, Five-digit Supplemental.

EAN8. A parameter that specifies a bar code type of European Article Numbering 8 (includes Japanese Article Numbering-short).

EAN13. A parameter that specifies a bar code type of European Article Numbering 13 (includes Japanese Article Numbering-standard).

EBCDIC. See *Extended Binary-Coded Decimal Interchange Code*.

electronic overlay. In IBM Print Server Facility, a collection of constant data that are electronically composed in the host processor and can be merged with variable data on a sheet during printing. Contrast with *page segment*. See also *overlay*, *preprinted form*.

European Article Numbering (EAN). The bar code symbology used to code grocery items in Europe.

Extended Binary-Coded Decimal Interchange Code (EBCDIC). A coded character set that consists of eight-bit coded characters.

external library resource (member). Objects that can be used by other program products while running print jobs; for example, coded fonts, code pages, font character sets, form definitions, page definitions, and page segments. Synonym for *resource object*.

external object. Synonym for *resource object*.

F

FCB. Forms control buffer.

field. (1) In a record, a specified area used for a particular class of data; for example, a group of character positions used to enter or display wage rates on a screen. (2) In Page Printer Formatting Aid, any area of a record singled out for particular formatting treatment.

field processing. Mapping individual fields to a page of output with special formatting controls.

file. A named set of records stored or processed as a unit.

first read rate. The percentage of the bar code scans that read correctly on the first scan of the bar code. A 99% or higher first read is desirable. Anything below 85% is normally not acceptable.

fixed medium information. Information that can be applied to a sheet by a printer or printer-attached device that is independent of data provided through the data stream. Fixed medium information does not mix with the data provided by the data stream and is presented on a sheet either before or after the text, image, graphics, or bar code data provided within the data stream. Fixed medium information can be used to create "pre-printed forms", or other types of printing, such as colored logos or letterheads, that cannot be created conveniently within the data stream.

FOCA. See *Font Object Content Architecture*.

font. A family or assortment of characters of a given size and style; for example, 9-point Bodoni Modern.

font character set. A FOCA resource containing descriptive information, font metrics, and the digital representation of character shapes for a specified graphic character set.

Font Object Content Architecture (FOCA). An architected collection of constructs used to describe fonts and to interchange those font descriptions.

Font Typeface Global Identifier (FGID). See *global resource identifier (GRID)*.

form. A physical piece of paper or other medium on which output data is printed. For cut-sheet printers, a form is one sheet of paper or other medium. For continuous-forms printers, the form is the area of paper (or other medium) defined to the printer as a single physical page, which for fan-fold paper is normally the area between perforations. See also *medium*, *sheet*, and *page*.

format. The arrangement or layout of data on a physical medium or in a presentation space.

formatted data. In FD:OCA, data whose implied syntax and semantics are represented by architected controls that accompany the data.

formatted data object (FDO). An object that contains formatted data. See also *object*.

Formatted Data Object Content Architecture (FD:OCA). An architected collection of constructs used to interchange formatted data.

formatter. A process used to prepare a document for presentation.

Formdef. See *Form Definition*.

form definition. In IBM Print Server Facility, a resource object that defines the characteristics of the form, which include: overlays to be used, text suppression, position of page data on the form, and modifications and number of copies of a page.

forms control buffer (FCB). A line printer control. In the 3800 Printing Subsystem, a buffer for controlling the vertical format of printed output.

forms flash. (1) In the 3800 Printing Subsystem, the function of the printer that allows user-prepared images to be printed with variable page data. An operator must insert the desired image holder when forms overlay printing is desired. (2) The photographic negative of a predefined design to be exposed to the photoconductor by a flash of light. The forms overlay can be merged with variable data during printing. See also *electronic overlay*.

G

GCGID. See *Graphic Character Global Identifier*.

GCSGID. See *Graphic Character Set Global Identifier*.

GID. See *global identifier*.

Global Identifier (GID). Any of the following:

- Code Page Global ID (CPGID)
- Graphic Character Global Identifier (GCGID)
- Font Typeface Global Identifier (FGID)
- Graphic Character Set Global Identifier (GCSGID)
- Coded Graphic Character Set Global Identifier (CGCSGID)
- In MO:DCA, an encoded graphic character string that provides a reference name for a document element.
- Global Resource Identifier (GRID)
- Object Identifier (OID)
- Coded Character Set Identifier (CCSID).

global resource identifier (GRID). An eight-byte identifier that identifies a coded font resource. A GRID contains the following fields in the order shown:

1. GCSGID of a minimum set of graphic characters required for presentation. It can be a character set that is associated with the code page, or with the font character set, or with both.
2. CPGID of the associated code page
3. FGID of the associated font character set
4. Font width in 1440ths of an inch.

GOCA. See *Graphics Object Content Architecture*.

graphic character. A member of a set of symbols that represent data. Graphic characters can be letters, digits, punctuation marks, or other symbols. Synonymous with *glyph*. See also *character*.

Graphic Character Global Identifier (GCGID). An alphanumeric character string used to identify a specific graphic character. A GCGID can be from four-bytes to eight-bytes long.

graphic character identifier. The unique name for a graphic character in a font or in a graphic character set. See also *character identifier*.

Graphic Character Set Global Identifier (GCSGID). A unique graphic character set identifier that can be expressed as either a two-byte binary or a five-digit decimal value.

graphics command set. In the IPDS architecture, a collection of commands used to present GOCA data in a page, page segment, or overlay.

graphics object. An object that contains graphics data. See also *object*.

graphics object area. A rectangular area on a logical page into which a graphics presentation space window is mapped.

Graphics Object Content Architecture (GOCA). An architected collection of constructs used to interchange and present graphics data.

GRID. See *global resource identifier*.

guard bars. The bars at both ends and the center of an EAN, JAN, or UPC symbol, that provide reference points for scanning.

H

height. (1) In Page Printer Formatting Aid, refers to the vertical dimension of a logical page and is controlled by the HEIGHT subcommand. (2) In bar codes, the bar dimension perpendicular to the bar width. Synonymous with *bar height* and *bar length*.

hexadecimal. A number system with a base of sixteen. The decimal digits 0 through 9 and characters A through F are used to represent hexadecimal digits. The hexadecimal digits A through F correspond to the decimal numbers 10 through 15, respectively. An example of a hexadecimal number is X'1B', which is equal to the decimal number 27.

highlighting. The emphasis of displayed or printed information. Examples are increased intensity of selected characters on a display screen and exception highlighting on an IPDS printer.

host. (1) In the IPDS architecture, a computer that drives a printer. (2) In IOCA, the host is the controlling environment.

HRI. See *human-readable interpretation*.

human-readable interpretation (HRI). The printed translation of bar code characters into equivalent Latin alphabetic characters, Arabic numeral decimal digits, and common special characters normally used for printed human communication.

I

image. An electronic representation of a picture produced by means of sensing light, sound, electron radiation, or other emanations coming from the picture or reflected by the picture. An image can also be generated directly by software without reference to an existing picture.

image content. Image data and its associated image data parameters.

Image Object Content Architecture (IOCA). An architected collection of constructs used to interchange and present images.

in. Inches.

IND2OF5. A parameter that specifies a bar code type of Industrial 2-of-5.

InfoPrint Manager. A print management product that runs on an AIX or Windows operating system. InfoPrint Manager handles the scheduling, archiving, retrieving, and assembly of a print job and its related resource files. It also tracks the finishing and packaging of the printed product.

inline. In printing, the direction of successive characters in a line of text. Synonymous with *inline direction*.

inline direction. Synonym for *inline*.

Intelligent Printer Data Stream (IPDS). An architected host-to-printer data stream that contains both data and controls defining how the data is to be presented.

intercharacter gap. The space between characters in a discrete bar code symbology.

International Organization for Standardization (ISO). An organization of national standards bodies from various countries established to promote development of standards to facilitate international exchange of goods and services, and develop cooperation in intellectual, scientific, technological, and economic activity.

Invoke Data Map. A control record placed in the user's data to begin a new page format.

Invoke Medium Map. A control record placed in the user's data to begin a new copy group.

IOCA. See *Image Object Content Architecture*.

IPDS. See *Intelligent Printer Data Stream*.

ISO. See *International Organization for Standardization*.

italics. A typeface with characters that slant upward to the right. In FOCA, italics is the common name for the defined inclined typeface posture attribute or parameter.

ITL2OF5. A parameter that specifies a bar code type of Interleaved 2-of-5, Automatic Identification Manufacturers Uniform Symbol Specification-I 2/5.

J

JAN. See *Japanese Article Numbering*.

Japanese Article Numbering (JAN). The bar code symbology used to code grocery items in Japan.

jog. Offset stacking of individual sheets or sets of sheets in the output hopper of a page printer or copy mark in a continuous forms printer.

K

kanji. A graphic character set consisting of symbols used in Japanese ideographic alphabets. Each character is represented by 2 bytes.

keyword. A two-part self-defining parameter consisting of a one-byte identifier and a one-byte value.

L

ladder orientation. Linear bar code orientation where the bars are parallel to the base of the document (like the rungs of a ladder). Sometimes called vertical orientation (because that is the direction of the scan).

landscape presentation. The position of a printed sheet that has its long edges at the top and bottom and its short edges at the sides. Contrast with *portrait presentation*.

language. A set of symbols, conventions, and rules that is used for conveying information.

leading. A printer's term for the distance between lines of type measured in points. It refers to the lead slug placed between lines of type in traditional typesetting.

library. System storage for generated form definitions and page definitions.

library resource (member). A named collection of records or statements in a library.

library resource name. A name by which an object may be called from a library by IBM Print Server Facility as part of a print job. Includes the two-character prefix for the type of object, such as P1 for page definitions, F1 for form definitions, or O1 for overlays (also known as *resource name*).

line attributes. Those attributes that pertain to straight and curved lines. Examples of line attributes are line type and line width.

line data files. Files formatted for printing on line printers.

line printer. A device that prints a line of characters as a unit. Synonymous with *line-at-a-time printer*. Contrast with *page printer*.

line type. A line attribute that controls the appearance of a line. Examples of line types are dashed, dotted, and solid. Contrast with *line width*.

line width. A line attribute that controls the appearance of a line. Examples of line width are light, medium, and bold. Contract with *line type*.

lines per inch (lpi). (1) On a printer, a measurement of the number of lines per vertical inch of paper. (2) A unit of measure for specifying the baseline increment.

local name. A name for a suppression, an overlay, or a font that is used only within the Page Printer Formatting Aid command stream. Contrast with *user-access name*.

location. A site within a data stream. A location is specified in terms of an offset in the number of structured fields from the beginning of a data stream, or in the number of bytes from another location within the data stream.

logical page. (1) The area on a surface of a form that is formatted for printing. (2) A collection of data that can be printed on one side of a sheet of paper. See also *form* and *page*.

logical page origin. (1) The user-defined point that acts as a reference for all positioning of printed material on the page. (2) The point nearest the hardware origin where printing can occur.

Logical unit (L-unit). A unit of linear measurement expressed with a unit base and units per unit-base value. For example , in Page Printer Formatting Aid, 1 logical unit = 1/240 inch (unit base = 10 inches, units per unit base = 2400).

lpi. Lines per inch.

lowercase. Pertaining to small letters as distinguished from capital letters. Examples of small letters are *a*, *b*, and *g*. Contrast with *uppercase*.

L-unit. A unit of linear measurement expressed with a unit base and units per unit-base value. In other words, the number of units in a linear inch. Synonymous with *logical unit*.

M

MAT2OF5. A parameter that specifies a bar code type of Matrix 2-of-5.

media origin. The first hardware addressable point on the physical page. The point from which the logical page origin is positioned by the medium map.

medium. The physical material (for example, paper) on which data is printed. See also *form*.

medium map. An internal object whose structured fields control the physical sheets of a printout, including the choice of duplex printing, the beginning print position, and the paper source to use. Controlled by a COPYGROUP command in a Page Printer Formatting Aid command stream.

medium overlay. Synonym for *overlay*.

mixed data files. Files consisting of composed and uncomposed portions.

mm. Millimeters.

MOD. A parameter that specifies additional processing information about the bar code symbol to be generated. Refer to *Data Stream and Object Architecture: Bar Code Object Content Architecture Reference* (S544-3766) for more information.

Mixed Object Document Content Architecture (MO:DCA). (1) An architected, device-independent data stream for interchanging documents. (2) Print data that has been composed into pages. Text formatting programs can produce composed text data consisting entirely of structured fields.

MO:DCA. See *Mixed Object Document Content Architecture*.

MO:DCA-P. Mixed Object Document Content Architecture for Presentation.

module. In a bar code symbology, the nominal width of the smallest element of a bar or space. Actual bar code symbology bars and spaces can be a single module wide or some multiple of the module width. The multiple need not be an integer.

MODWIDTH. A parameter that specifies the width of the smallest defined bar code element, using mils (thousandths of an inch).

MSI. A parameter that specifies a bar code type of modified Plessey code.

multiple up. The printing of more than one page on a single side of a sheet of paper.

MVS or OS/390. Multiple Virtual Storage. (Changed to OS/390).

N

name. A table heading for architecture syntax. The entries under this heading are short names that give a general indication of the contents of the construct.

noncompatibility mode. The use of table reference character (TRC) numbers not compatible with a line printer.

normal duplex printing. Duplex printing for sheets that are to be bound on the long edge of the paper, regardless of whether the printing is portrait or landscape. Contrast with *tumble duplex printing*.

N_UP. The printing of more than one logical page on a single side of a medium.

O

object. A collection of data referred to by a single name. Form definitions and page definitions stored in a library are resources.

offset. A table heading for architecture syntax. The entries under this heading indicate the numeric displacement into a construct. The offset is measured in bytes and starts with byte zero. Individual bits can be expressed as displacements within bytes.

order. In GOCA, a graphics construct that the controlling environment builds to instruct a drawing processor about what to draw and how to draw it.

orientation. The angular distance a presentation space or object area is rotated in a specified coordinate system, expressed in degrees and minutes. For example, the orientation of printing on a physical medium, relative to the X_m axis of the X_m,Y_m coordinate system.

origin. A picture element (pel)

outline font. A shape technology in which the graphic character shapes are represented in digital form by a series of mathematical expressions that define the outer edges of the strokes. The resultant graphic character shapes can be either solid or hollow.

overlay. A collection of predefined data such as lines, shading, text, boxes, bar codes, or logos, that can be merged with variable data on a page during printing. See *electronic overlay*.

Overlay Generation Language (OGL). A programming language used to produce electronic overlays.

P

page. (1) A collection of data that can be printed on one side of a sheet of paper or a form. (2) The boundary for determining the limits of printing. See also *logical page* and *physical page*.

page definition. A resource containing a set of Page Printer Formatting Aid formatting controls for printing pages of data. Includes controls for number of lines per printed sheet, font selection, print direction, and mapping of individual fields in the data to positions on the printed sheets.

page ejection. The point at which the printer finishes printing on one sheet and moves to the beginning of the next sheet.

page format. A subset of a page definition, containing all the same controls for formatting printed output as a page definition. Includes controls for number of lines per printed sheet, font selection, print direction, and mapping of individual fields in the data to positions on the printed sheets.

page mode. The mode of operation in which an AFP printer can accept a page of data from a host processor to be printed on an all-points-addressable output medium. Printed data can consist of pages composed of text, images, overlays, and page segments. Contrast with *compatibility mode*.

page printer. A device that prints a page at a time. Contrast with *line printer*.

Page Printer Formatting Aid (PPFA). An IBM licensed program that allows you to create and store form definitions and page definitions, which are resource objects for print-job management. By writing a command stream specifying form definitions, page definitions, or both, for executing Page Printer Formatting Aid, you can store the objects specified in the library. These objects can then be used to format printed output.

page segment. (1) An object that can contain text and images and be included at any addressable point on a page or electronic overlay. It assumes the environment of an object it is included in. (2) A library resource that contains the definition of a page segment. Contrast with *electronic overlay*.

parameter. (1) A variable that is given a constant value for a specified application and that may denote the application. (2) In Page Printer Formatting Aid, the values specified for a subcommand.

partition. (1) Dividing the medium presentation space into a specified number of equal-sized areas in a manner determined by the current physical media. (2) In FD:OCA, a conceptual subdivision of a string of data fields. A partition can be further divided into subpartitions.

pel. Picture element. The smallest printable or displayable unit on a physical medium. In computer graphics, the smallest element of a physical medium that can be independently assigned color and intensity. Synonymous with *picture element* and *pixel*.

PELS. In Page Printer Formatting Aid, a unit of measure under the SETUNITS command. See also *logical unit*.

physical page. A single surface (front or back) of a sheet. See also *form* and *page*.

picket fence orientation. Linear bar code orientation where the bars are perpendicular to the base of the document (like the pickets in a picket fence). Sometimes called horizontal orientation (because that is the direction of the scan).

picture element. (1) In computer graphics, the smallest element of a display space that can be independently assigned color and intensity. (2) The smallest area that can be individually toned by the printer.

pixel. The smallest printable or displayable unit on a physical medium. Synonymous with *pel* and *picture element*.

PMF. Print Management Facility

point. In printing, a unit of about 1/72 of an inch used in measuring typographical material, for example: 10-point Helvetica. There are 12 points to a pica.

portrait presentation. The position of a printed sheet that has its short edges at the top and bottom and its long edges at the sides. Contrast with *landscape presentation*.

position. The location specified for a line or field on the output page.

POSTNET. A parameter that specifies a bar code type of POSTal Numberic Encoding Technique (United States Postal Service), and defines specific values for the BSD module width, element height, height multiplier, and wide-to-narrow ratio fields.

PPFA. Page Printer Formatting Aid.

preprinted form. A sheet of paper containing a preprinted design of constant data. Variable data can be merged with the constant data on such a form. See also *electronic overlay*, *forms flash*.

print line. A single line of text. In the formatting of line data, it refers to the output generated by one data record. Governed by the PRINTLINE command.

Print Management Facility (PMF). A program that can create fonts, segments, page definitions, and form definitions.

Print Server Facility (PSF). A program that produces printer commands from the data sent to it.

printer–attached device. Either a preprocessor or postprocessor attached to the printer.

PSF. Print Server Facility.

Q

quiet zone. A blank area prior to and following a bar code. This required space enables the scanner to differentiate the start and stop of a bar code. The size of the quiet zone is usually 10 times the x-dimension or 1/4 inch, whichever is larger.

R

range. A table heading for architecture syntax. The entries under this heading give numeric ranges applicable to a construct. The ranges can be expressed in binary, decimal, or hexadecimal. The range can consist of a single value.

raster. (1) In computer graphics, a predetermined pattern of lines that provides uniform coverage of a display space. (2) In AFP printers, an on-or-off pattern of electrostatic images produced by the laser print head.

RASTER / NORASTER subcommand. A subcommand that specifies whether an overlay is to be kept in the printer (3800 only) as raster data.

RATIO. A parameter that specifies the ratio of the wide-element dimension to the narrow-element dimension whenever two different size elements exist.

ratio. The relationship in quantity, amount, or size between two or more things.

record. (1) In programming languages, an aggregate that consists of data objects, possibly with different attributes, that usually have identifiers attached to them. In some programming languages, records are called structures. (2) A set of data treated as a unit. (3) A set of one or more related data items grouped for processing.

RM4SCC. A parameter that specifies a 4-state customer code defined by the Royal Mail Postal Service of England for bar coding postal code information. See *Royal Mail 4 State Customer Code*.

resource. A collection of printing instructions, and sometimes data to be printed, that consists entirely of structured fields. A resource object is stored as a member of a library and can be called for by IBM Print Server Facility when needed. The different resource objects are: page segments, overlays, form definitions, and page definitions.

RNORMAL. Rotated normal. A Page Printer Formatting Aid parameter that specifies the type of duplex printing. It means the tops of both sides of a duplex-printed sheet are toward the same physical edge of the sheet, for side binding of the document. Used with landscape-presentation pages.

rotation. The orientation of the characters of a font with respect to the baseline.

Royal Mail 4 State Customer Code (RM4SCC). A two-dimensional bar code symbology developed by the United Kingdom's Royal Mail postal service for use in automated mail-sorting processes.

RTUMBLE. Rotated tumble. A Page Printer Formatting Aid parameter that specifies a type of duplex printing. It means the top of one side of a duplex-printed sheet and the bottom of the other are toward one physical edge of the sheet, for top binding of the document. Used with landscape-presentation pages.

rule. A solid line of any line width.

S

SBCS. Single-byte character set.

scanner. In bar codes, an electronic device that converts optical information into electrical signals. Sometimes called a *reader* or *decoder*.

segment. (1) A collection of composed text and images, prepared before formatting and included in a document when it is printed. See *page segment*. (2) The resource that contains the structured-field definition of a page segment.

sheet. A single piece of paper. For cut-sheet printers, a synonym for *form*.

shift-in and shift-out characters (SOSI). Characters used to delimit literals in Page Printer Formatting Aid command streams: X'0E' and X'0F'.

simplex printing. A method used to print data on one side of a sheet; the other side is left blank. Contrast with *duplex printing*.

single-byte character set. A character set whose codes require a single byte of data. The character set used for English is an example.

skip-to-channel control. A line printer control appearing in line data. Allows space to be left between print lines. Compatible with page printers when the data is formatted by page definitions.

space. In bar codes, the lighter element of a printed bar code symbol, usually formed by the background between bars.

space width. In bar codes, the thickness of a bar code symbol space measured from the edge closest to the symbol start character to the trailing edge of the same space.

SSASTERISK. A parameter that specifies whether an asterisk is to be generated as the HRI for **CODE39** bar code start and stop characters.

start-stop character or pattern. In bar codes, a special bar code character that provides the scanner with start and stop reading instructions as well as a scanning direction indicator. The start character is normally at the left end and the stop character at the right end of a horizontally-oriented bar code symbol.

structured field. A self-identifying string of bytes and its data or parameters.

subcommand. (1) In Page Printer Formatting Aid, the next level of control below commands. (2) A request for an operation that is within the scope of work requested by a previously issued command.

subgroup. A subset of a form definition that is used to reprint the same page of data more than once. Subgroups provide for variations in the same page of data within one print job. Modifications that distinguish one subgroup from another are number of copies, type of duplex printing, inclusion of overlays, inclusion of suppressions, and (only for the 3800 printer) forms flash. A set of modifications within a copy group that applies to a certain number of copies of a form. A copy group can contain more than one subgroup.

subpage. A part of a logical page on which line data may be placed. In the page definition, multiple subpages can be placed on a physical page based on changes in the print data.

suppression. The electronic equivalent of a spot carbon, preventing selected data from being printed on certain copies.

symbology. A bar code language. Bar code symbologies are defined and controlled by various industry groups and standards organizations. Bar code symbologies are described in public domain bar code specification documents. Synonymous with *bar code symbology*. See also *Canadian Grocery Product Code (CGPC)*, *European Article Numbering (EAN)*, *Japanese Article Numbering (JAN)*, and *Universal Product Code (UPC)*.

syntax. The rules governing the structure of a construct.

T

table reference character (TRC). Usually, the second byte on a line in the user's data. This byte contains a value (0 - 126) that is used to select a font to be used to print that line.

tate. The Japanese word for top-to-bottom, as applied to the formatting of writing and printing. The traditional arrangement of Japanese kanji characters on the page. Pronounced ***ta***-tay.

text. A graphic representation of information on an output medium. Text can consist of alphanumeric characters and symbols arranged in paragraphs, tables, columns, and other shapes.

TRC. Table reference character.

truncation. Planned or unplanned end of a presentation space or data presentation.

tumble duplex printing. Duplex printing for sheets that are to be bound on the top, as is often done for legal documents. The top of one side of each sheet is at the same edge as the bottom of the other side. Contrast with *normal duplex printing*.

triplet. A three-part self-defining variable-length parameter consisting of a length byte, an identifier byte, and one or more parameter-value bytes.

type. A table heading for architecture syntax. The entries under this heading indicate the types of data present in a construct. Examples include: BITS, CHARCODE, SBIN, UBIN, UNDF.

TYPE. A parameter that specifies the kind of bar code symbol to be generated. For example, CODE39, MSI, UPCA, UPCE, and so on.

type font. See *font*.

type weight. A parameter indicating the degree of boldness of a typeface. A character's stroke thickness determines its type weight. Examples are light, medium and bold.

type width. A parameter indicating a relative change from the font's normal width-to-height ratio. Examples are normal, condensed and expanded.

U

unformatted print data. Data that is not formatted for printing. A page definition can contain controls that map unformatted print data to its output format.

Uniform Symbol Specification (USS). A series of bar code symbology specifications published by AIM; currently included are USS-Interleaved 2 of 5, USS-39, USS-93, USS-Codabar, and USS-128.

Universal Character Set (USC). A printer feature that permits the use of a variety of character arrays. Synonymous with *font*.

Universal Product Code (UPC). A standard bar code symbology, commonly used to mark the price of items in stores, that can be read and interpreted by a computer.

unprintable area. The area of a sheet of paper on which no printing can be done because of printer and hardware limitations.

UPC. See *Universal Product Code*.

UPCA. A parameter that specifies a bar code type of Universal Product Code (United States) and the Canadian Grocery Product Code, Version A.

UPCE. A parameter that specifies a bar code type of Universal Product Code (United States) and the Canadian Grocery Product Code, Version E.

UPC2SUPP. A parameter that specifies a bar code type of Universal Product Code (United States) two-digit Supplemental (periodicals).

UPC5SUPP. A parameter that specifies a bar code type of Universal Product Code (United States) five-digit Supplemental (paperbacks).

uppercase. Pertaining to capital letters. Examples of capital letters are *A*, *B*, and *C*. Contrast with *lowercase*.

user-access name. The library resource name of a font or an overlay, less its two-character prefix. Contrast with *local name*.

USS. See *Uniform Symbol Specification*.

W

wide-to-narrow ratio. The ratio of the width of the wide bar or space to the narrow bar (x-dimension) or space in a two-width symbology. This ratio is usually in the range of 2:1 to 3:1.

width. In Page Printer Formatting Aid, refers to the horizontal dimension of a logical page, is specified in the page definition, and is controlled by the WIDTH subcommand.

X

x-coordinate. The horizontal or inline position that defines a page origin or the starting point of a line or field.

x-dimension. The width (usually in thousandths of an inch) of the narrow bar or space of the bar code symbology.

Y

y-coordinate. The vertical or baseline position that defines a page origin or the starting point of a line or field.

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